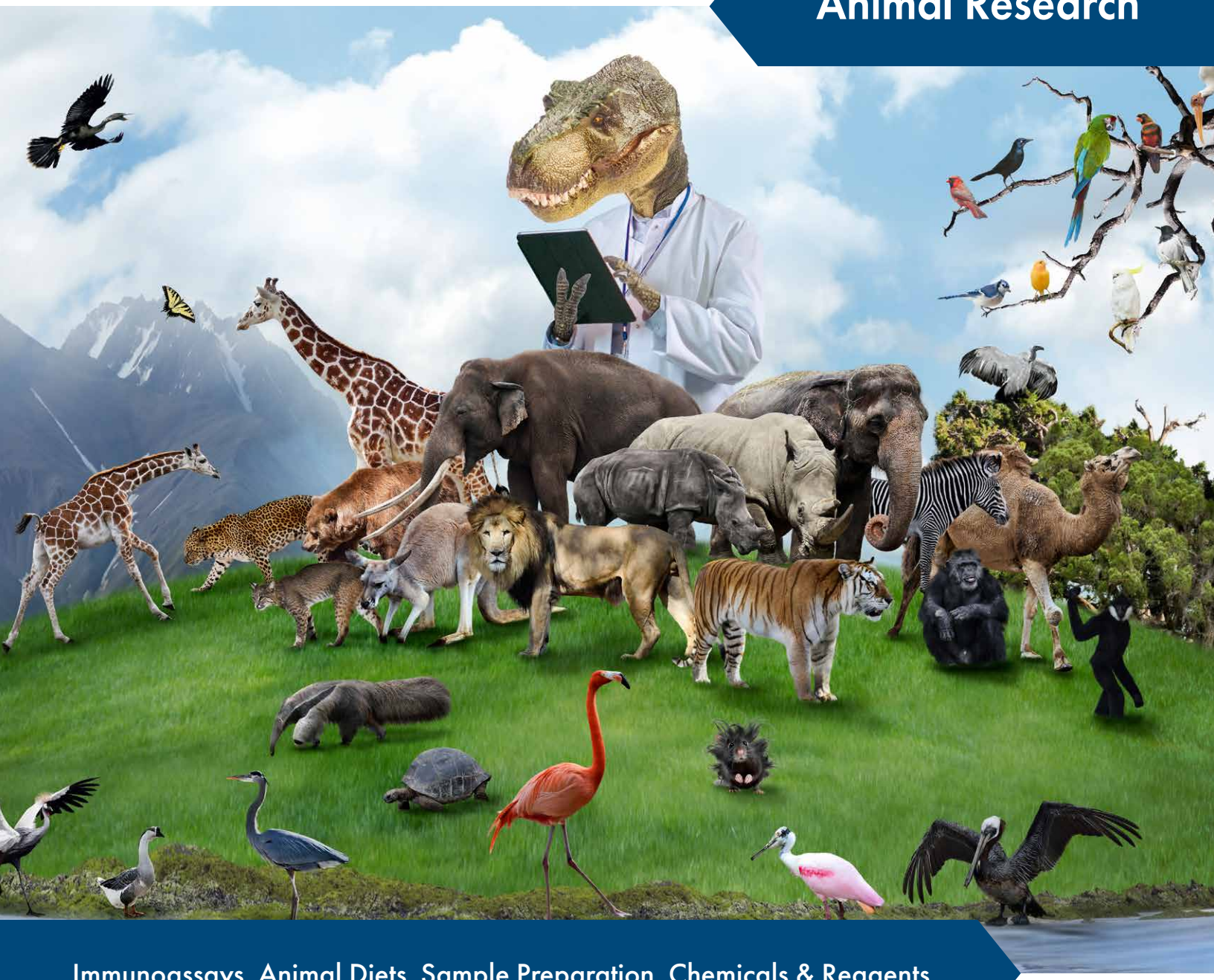
MP

Kits and Reagents for

Animal Research



Immunoassays, Animal Diets, Sample Preparation, Chemicals & Reagents

- Diets for Research Animals
- Animal Science Research
- Veterinary Science Research
- Laboratory Animal Science
- Wildlife Monitoring
- Animal Welfare

Find it at **fishersci.com**

fisher scientific
part of Thermo Fisher Scientific

Studying Stress?

Trust the Gold Standard in Corticosterone measurement

- Proven performance and reliability for over 30 years
- Over 2,500 scientific publications
- Adaptable to many species and sample types
- Highly sensitive

MP Bio Corticosterone RIA Kit *(see page 26)*

Other Stress Research Immunoassays *(see page 27)***:**

ACTH • Cortisol • Dopamine • Epinephrine • Growth Hormone • Norepinephrine • Prolactin

One Call. One Source.
A World of Animal Research Products.

MP Biomedicals provides essential tools for life science and diagnostic teams dedicated to improving the quality of life. We partner with our customers, and the wider scientific community, to advance the science of medical diagnostics and life science research. Quality products, innovative technology and expert knowledge all play an essential role in the scientific pursuit for answers.

Providing Reliable Animal Research Diagnostic Solutions for Over 40 Years

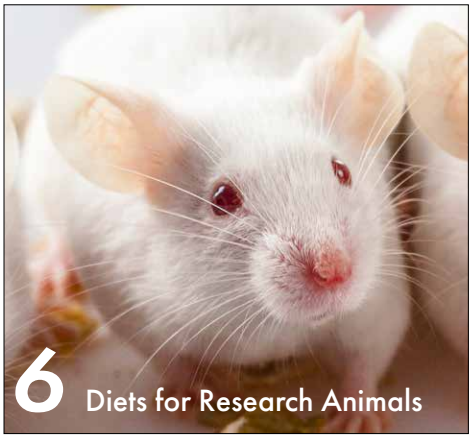
Animal research is vital in our quest for improving the quality of life for both humans and animals. Nearly all medical breakthroughs originally started from animal models which eventually progressed into clinical studies, and finally reached the market to be utilized to improve health, economics, scientific understanding, and overall quality of life for both humans and animals. Millions of lives have been affected by the critical animal research that is being performed. Our goal at MP Bio is to support researchers with the tools they need to conduct powerful research and ***make an impact***.

- **Animal Science:** Animal Scientists are dedicated to advancing our understanding of all types of animals, including farm animals, wildlife, zoo animals, pets and laboratory animals. These animals are important as they provide us with food, clothing, labor and companionship, as well as playing a major role in scientific research. From reproduction management of bovine, to understanding the effect of environmental stress on wildlife, Animal Scientists rely on MP Bio Immunoassays for accurate and reliable measurements.
- **Veterinary Science:** Veterinary Scientists aim to better understand animal health and disease, and how Veterinarians can apply this knowledge to the animals they care for. Veterinary Science explores the habits and care of domesticated and wild animals, which includes topics such as pet health, wildlife conservation and breeding/ reproductive management. MP Bio supports this research by providing high-quality, reliable assays and reagents.
- **Laboratory Animal Science and Other Animal Models in Research:** The use of animal models in research over the last few centuries has been instrumental in achieving the vast knowledge we have today of numerous human conditions and diseases. Animal models give us the ability to conduct breakthrough scientific research leading to discoveries in all areas of human physiology, including diagnosis and treatment of many diseases. From reproductive management to measuring stress levels, our kits and reagents provide you with accurate results every time.
- **Wildlife Monitoring:** Studying and understanding animals in the wild can provide impactful insight into the world around us and how certain circumstances can positively or negatively affect a species. We are proud to supply researchers with the solutions they need to continue to learn about and monitor the wildlife surrounding us.
- **Animal Welfare:** Through many advances in technology and practical applications, animal testing has become more efficient and humane, with the overall intent to cause less harm to animals while preserving the quality of research. Our immunoassays provide the detailed information you need to help improve the welfare of laboratory animals.

It is our mission to provide reliable, high quality products to ensure accurate results for your lab. Our worldwide Technical Service Department is available to deliver expert advice and answers when you have questions or need additional information. Highly trained team members are experienced in all aspects of life science and diagnostic applications and will help you find solutions quickly and efficiently. With ISO-certified and FDA-approved manufacturing and distribution facilities throughout the globe, we are committed to providing high quality diagnostic tests and life science reagents that help advance scientific discovery, improve health and manage diseases.

We deliver the tests you need and the results you can trust.

CONTENTS



Diets for Research Animals 6

Standard Research Diets 6
Research Diet Basics 8
Mineral & Salt Mixes 8
Vitamin Mixtures 9
Additional Diet Ingredients 9

Animal Science Research 10

MP Chemiluminescence Immunoassays 10
Reproductive Hormone Testing 11
Equine 12
Ruminant 12
Research in Animal Science using MP Bio Immunoassays 13

Veterinary Science Research 14

Reproductive Management 14
Canine 14
Feline 14
Thyroid Hormone Testing 16
MP Bio Immunoassays for Thyroid Hormone Testing 17
Adrenal-associated Endocrinopathies 18
Addison's Disease 18
Cushing's Syndrome 18
Dexamethasone Suppression Test 18
ACTH Stimulation Test 19
Endogenous ACTH Serum Test 19
MP Bio Immunoassays for Adrenal-associated Endocrinopathy Testing 19
MP Bio Immunoassays for Animal Research 21
AlbumiNZ™ Bovine Serum Albumin (BSA) 22
Sensitive and Specific Coombs' Test (Anti-Globulin) for Animal Studies 23

Laboratory Animal Science and Other Animal Models in Research 24

Animal Applications for Human Diagnostic Kits - Feasibility Checklist 24
Reproductive Hormone Testing in Laboratory Animals 25
MP Bio Corticosterone RIA Kit for Stress Research 26
Corticosterone RIA Kit 26
MP Bio Immunoassays for Stress Research 27
Hundreds of Species Validated Using the MP Bio Corticosterone RIA Kit 28
Stress Research References 29
Animal Sera for Immunoassays 31
DSS Induced Colitis Research Model 32
Improve effectiveness of DSS by combining with Azoxymethane (AOM) 34
Dosage of DSS for Different Strains of Mice 35
Isolation of Cells from Blood and Plasma 36
Mononuclear Cell Isolation for Research Use 36
Lymphocyte Separation for in vitro Diagnostics 36
Mononuclear and Polymorphonuclear Isolation in One Step 36
Induced Immune Response in Animals 37
Sample Preparation and Nucleic Acid Isolation 38
FastPrep-24™ 5G Instruments and Adapters 38
FastPrep-96™ Instruments and Adapters 40
Lysing Matrix Tubes 41
DNA Isolation from Animal Tissues and Cells 43
RNA Isolation from Animal Tissues and Cells 45
Extraction Kits for Automated Nucleic Acid Purification 46

Wildlife Monitoring 47

Wildlife Stress Research 48

Animal Welfare 49

Species Reference Table for MP Bio Immunoassays 50

Diets for Research Animals

Take a fresh look at MP Bio's prepared animal research diets. You'll discover an entirely new standard in quality, freshness and value. Whether you're studying obesity, type II diabetes, a vitamin or mineral deficiency, insect breeding or memory loss based on diet, MP Bio offers you a fresh perspective for your animal dietary needs.

Our animal diets and dietary components are of the finest quality and the most uniform of commercially available diets. Our specialists adhere to strict specifications and every component is extensively monitored throughout the entire manufacturing process to ensure greater consistency with every order.

Because dietary components vary in shelf-life, we choose not to stock any finished preparation. Instead, every diet is freshly formulated after an order has been placed. Furthermore, due to the tremendous volume of components we handle weekly, we are constantly restocking raw materials, so you can rest assured that
the diet ingredients are always fresh.

MP Bio has over five decades of experience in customized animal research diets and more than 15,000 successful custom formulations. We specialize in mineral and vitamin deficient diets. Upon request, we can easily change any combination of components in our existing diets or design a custom diet to your exact specifications. Each diet is produced specifically to your order. Take a fresh look and find the diet that will make your research project more palatable and effective.

Standard Research Diets

These research diets are routinely available standard preparations, made to order when you need them. Most are available in 10 kg, 20 kg and 50 kg packages (unless otherwise indicated), and in pelleted and/or powdered form, as you desire. Pellets may be color-coded for ease of identification, and pellet size may be varied to accommodate smaller or larger animals. Complete formulations can be found on our website at www.fishersci.com/mpbiomedicals.

Description	Size	Cat. No.
AIN-76 Semipurified Diet American Institute of Nutrition standard formulation for rats and mice for effective growth, appearance and survival.	10 kg, 20 kg, 50 kg	MP2905453
AIN-76C Semipurified Diet Basic animal diet for maintaining mouse and rat colonies in the research lab.	10 kg, 20 kg, 50 kg	ICN960296
AIN-93G Diet An updated formulation of AIN-76 Diet designed for growth, pregnancy and lactational phases of rodents.	10 kg, 20 kg, 50 kg	ICN960399
AIN-93M Diet An updated formulation of AIN-76 Diet designed for maintenance of adult rodents.	10 kg, 20 kg, 50 kg	ICN960397
Atherogenic Diet Rich in cholesterol and other atherogenic factors. Feeding mice with atherogenic diet can induce the formation of plaques in the inner lining of arteries associated with coronary heart disease.	10 kg, 20 kg, 50 kg	MP2960404
Calcium Deficient Diet Calcium deficient diet can be used to study calcium deficiency on bone density, osteoporosis and other calcium signaling pathways.	10 kg, 20 kg, 50 kg	ICN2960177
Carbohydrate Diet, High, Modified A normal test diet modified to contain 68% carbohydrate by weight.	10 kg, 20 kg, 50 kg	MP2960236

Description	Size	Cat. No.
2% Cholesterol Diet A complete rat feed with 2% cholesterol added.	10 kg, 20 kg, 50 kg	MP2904691
Choline Deficient Diet Choline Deficient Diet, is used for the study of typical cellular and extracellular adult liver progenitor cells in rodents.	10 kg, 20 kg, 50 kg	ICN/MP2960034
Dairy Butter Diet for Mice An atherogenic diet for mice.	10 kg, 20 kg, 50 kg	ICN2960393
Fat-Free Diet Fat Free diet has been used to study cholesterol metabolism.	10 kg, 20 kg, 50 kg	ICN2901683
Fat Diet, High Saturated Fat High Saturated Fat Diet has been used to induce obesity and high cholesterol in the mice.	10 kg, 20 kg, 50 kg	ICN2960242
Gypsy Moth Diet Gypsy Moth Diet is used for general colony maintenance of moth larvae.	1L, 4L	MP/ICN2960292
Magnesium Diet, Low Typically contains approximately 60 ppm magnesium.	10 kg, 20 kg, 50 kg	MP2960187
Methionine/Choline Deficient Diet This diet is used to study induction of non-alcoholic steatohepatitis (NASH) in experimental models and its routes of development.	10 kg, 20 kg, 50 kg	MP2960439
Methionine/Choline Control Diet This control diet triggers the resolution of hepatic inflammatory and fibrotic reactions and hepatocyte apoptosis, suggesting that MCDD-induced steatohepatitis is also reversible.	10 kg, 20 kg, 50 kg	MP2960441
Mouse Diet Purified A natural-ingredient diet specifically formulated to provide the proper balance of all known nutrients considered essential for the growth, maintenance, and reproduction of mice for lab experiments.	10 kg, 20 kg, 50 kg	ICN2904606
Vitamin D-Free Diet Used to study role of Vitamin D in carbohydrate metabolism.	10 kg, 20 kg, 50 kg	ICN2960074

Research Diet Basics

Looking to formulate or supplement your own special animal feed? Take a fresh look at our research diet components, including mineral and vitamin mixes, as well as a full list of individual ingredients ready for use. We offer proteins, carbohydrates, fats, oils and much more to simplify the preparation of your proprietary blend. MP Bio only uses the freshest ingredients in all of our diet formulations, and the same applies to our individual Diet Components. We also price them competitively, so you don't overspend when you blend!

Mineral & Salt Mixes

Many of MP Bio Mineral Mixes follow nationally accredited specifications and formulations to provide confidence in what you are feeding your animals. From the American Institute of Nutrition (AIN) formulae to USP specifications, our Mineral Mixes adhere to the strictest controls available. Quality tested and assured, using the best ingredients possible, check out our Mineral Mix offerings. Complete formulations may be found on our website at www.fishersci.com/mpbiomedicals.

Description	Size	Cat. No.
AIN-76 Mineral Mixture	2 kg, 10 kg	ICN2905455
AIN-93G Mineral Mix	2 kg, 10 kg	ICN2960400
AIN-93M Mineral Mix	2 kg, 10 kg	ICN2960401
Briggs Salt Mixture	2 kg, 10 kg	MP2902834
Hegsted Salt Mix	2 kg, 10 kg	MP2902840
Hubbel, Mandel & Wakeman Salt Mixture	2 kg, 10 kg	ICN2902838
Jones & Foster Salt Mix	2 kg, 10 kg	MP2902110
Phillips & Hart Salt Mix	2 kg, 10 kg	MP2902844
Rogers & Harper Salt Mix	2 kg, 10 kg	MP2902842
Salt Mix #2 USP XIII	2 kg, 10 kg	ICN2902845
Salt Mix USP XIV	2 kg, 10 kg	MP2902850
Sodium-Free Salt Mix for Rat	2 kg, 10 kg	MP2960352
Trace Minerals for Ultra Clean Environment	500 gm, 1 kg	ICN/MP2960264
Wesson Salt Mixture	2 kg, 10 kg	ICN2902851
Williams-Briggs Salt Mix	2 kg, 10 kg	MP2902837

Vitamin Mixtures

Proper nutrition in your animals' maintenance diets includes a complete regimen of daily vitamins. Consequently, MP Bio offers a range of vitamin mixtures to cover most needs. Further, if you wish to study specific vitamin effects, such as lack of Vitamin D or excess Vitamin B, we can customize a vitamin mix and diet to your exact specifications. Want to put together your own research diet? No problem, we have the following Vitamin mixtures available for your selection.

Description	Size	Cat. No.
AIN-76 Vitamin Mixture	1 kg	ICN2905454
AIN-76A Vitamin Mixture	1 kg	ICN2960098
AIN-93VX Vitamin Mixture	1 kg	ICN2960402
Vanderzant Modification Vitamin Mixture for Insects	1 kg, 5 kg	ICN2903244
Vitamin Diet Fortification Mixture	1 kg	ICN2904654

Additional Diet Ingredients

For those who prefer to formulate and mix their own research diets completely from scratch, we have a comprehensive range of ingredients from which you may select. Again, these individual diet components are of the finest quality available in the market, and always fresh. These individual ingredients are available in quantities from grams to kilos. So, if you're thinking of preparing your own research diets, take a fresh look at MP Bio's diet components and get started!

Description	Cat. No.
Alphacel Non-Nutritive Bulk	ICN2900453
Brewers Yeast	ICN2903312
Casein Purified High Nitrogen	ICN2901293
Cocoa Butter	MP2905417
Coconut Oil	MP2901403
Coconut Oil Hydrogenated	MP/ICN2901404
Cod Liver Oil	ICN2901405
Corn Ground Yellow	ICN2901411
Corn Oil	ICN2901414
Cottonseed Oil	ICN2901419

Description	Cat. No.
Dextrin Type II	ICN2901520
Dextrinized Corn Starch	MP2960429
D-(+)-Dextrose Anhydrous	ICN2901521
Dextrose Monohydrate	ICN2905594
Gelatin	ICN2960317
Linseed Oil, Raw	ICN2960122
Liver Powder	ICN2900396
Liver Concentrate Powder	ICN2900377
Menhaden Oil	ICN2960120
Milk Powder, Whole	ICN2902363

Description	Cat. No.
Milk Powder, Skim	MP2902887
Peanut Oil	ICN2904684
Soybean Meal Defatted	ICN2960024
Soy Protein Isolated	ICN2905456
Starch, Corn	ICN2902956
Sucrose	ICN2904713
Torula Yeast	ICN2903085
Wheat Germ	ICN2903288
Xanthan Gum	ICN2960021

MP Chemiluminescence Immunoassays

Highly Sensitive Detection of Hormones using MP Chemiluminescence Immunoassays

Endocrinology research today continues to advance our knowledge of how hormones work to regulate bodily and cellular functions, as well as how their misregulation can lead to a variety of disorders. Researchers all over the world are focused on discovering more about growth, metabolism, reproduction and neuroendocrinology to learn more about hormone-related and metabolic disorders. These disorders include hypothyroidism, hyperthyroidism, congenital adrenal hyperplasia, Cushing's disease, adrenal insufficiency, and endocrine neoplasia, as well as common metabolic disorders including diabetes, obesity, hypoglycemia, cystic fibrosis and phenylketonuria.

MP Bio offers hormone detection kits that allow you to carry out the critical research that is so important to advancing our knowledge of how hormones function. Our goal is to enable scientists with powerful research tools which can lead to the discovery of treatments for disorders that many people and animals are suffering from today. Our highly sensitive immunoassays for detecting hormone concentration levels have been utilized in laboratories for over 30 years by researchers all over the world, showing just how reliable our tests are at helping you to collect the information you need. MP Bio hormone detection kits are offered in multiple technology formats, including Radioimmunoassays (RIA), Enzyme Immunoassays (EIA) and our newly added Chemiluminescence Immunoassays (ChLIA). Simply rely on what works.

- **Ultra-Sensitive:** Low Limit of Detection
- **Simple:** Easy-to-Use Protocol
- **Time-Saving:** High-Throughput for Multiple Samples
- **Efficient:** Small Sample Volumes
- **Informative:** Quantitative Measurements
- **Fast:** Short Incubation Times
- **Flexible:** Ability to Adapt to a Variety of Animal Species*

Stressed about your research?
Trust our Assays!

Stress Hormones:
Cortisol, Human Growth Hormone (hGH), Prolactin

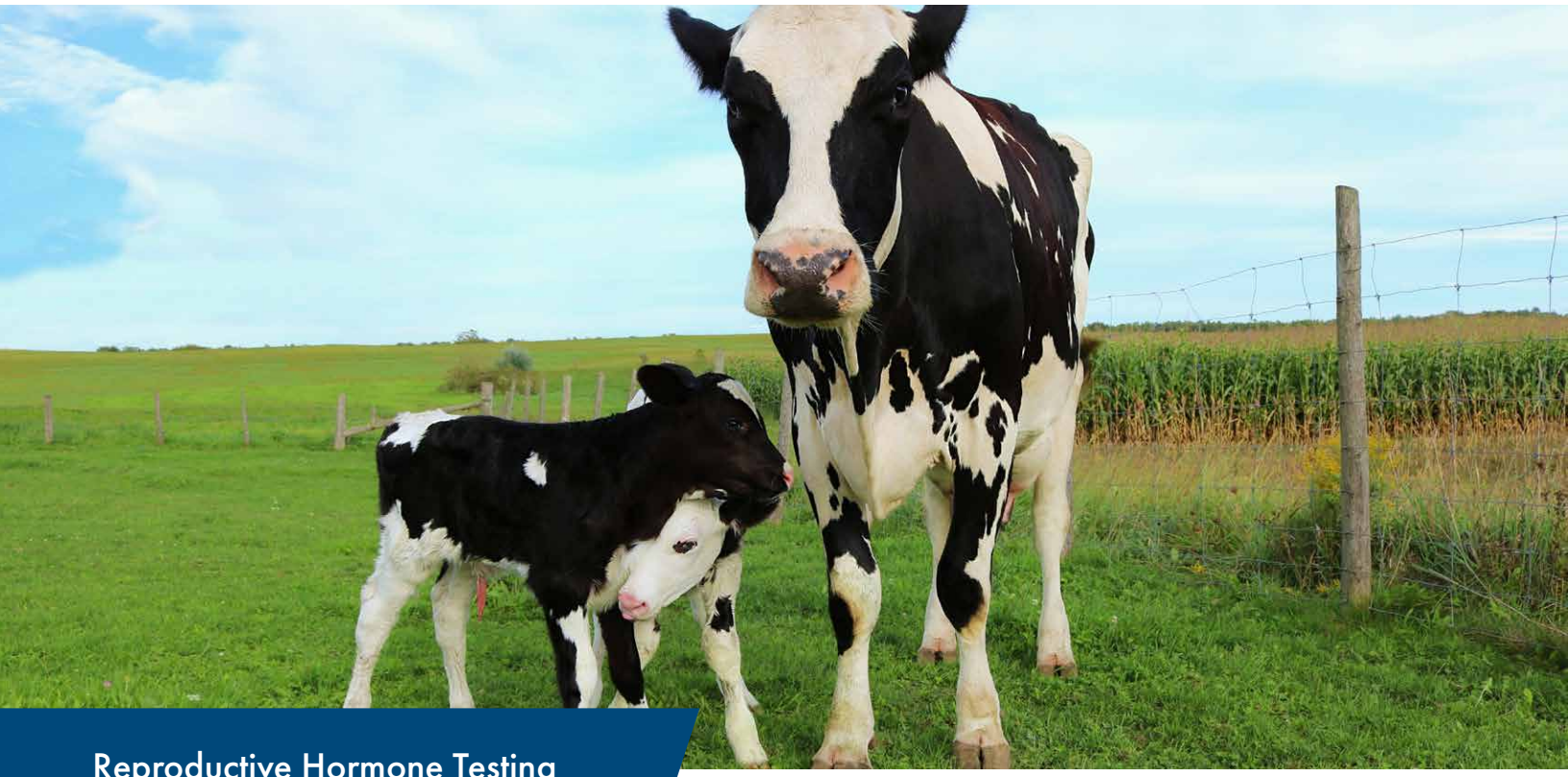
Thyroid Hormones:
Triiodothyronine (T3), Thyroxine (T4), Thyroid Stimulating Hormone (TSH)

Digestion/Metabolism Analytes:
C-Peptide, Insulin

Reproductive Hormones:
17β-Estradiol (E2), Follicle Stimulating Hormone (FSH), Human Chorionic Gonadotropin (hCG), Luteinizing Hormone (LH), Progesterone, Prolactin, Testosterone

Other Endocrinology Hormones:
17α-hydroxyprogesterone (17OHP), Dehydroepiandrosterone (DHEA), Dehydroepiandrosterone Sulfate (DHEA-S)

Animal Scientists are dedicated to advancing our understanding of all types of animals, including farm animals, wildlife, zoo animals, pets and laboratory animals. These animals are important as they provide us with food, clothing, labor and companionship, as well as playing a major role in critical scientific research. From reproduction management of bovine, to understanding the effect of environmental stress on wildlife, Animal Scientists rely on MP Bio Immunoassays for accurate and reliable measurements.



Reproductive Hormone Testing

Reproductive management has become increasingly important for livestock owners, as well as breeders of animals for companion or sport. The efficient production of food and milk from livestock is heavily dependent on the producer's ability to effectively manage the reproductive capacity of the farm. Even modest improvements in the efficiency of reproductive management could be worth millions of dollars annually. Breeders are also interested to know when their animals are ready to mate or be artificially inseminated, especially in species such as dogs, since their estrus window is relatively short and only occurs 2-3 times per year.

One of the most common ways to monitor the estrous cycle of an animal is by measuring the level of progesterone in their blood. The change in the level of progesterone can be used to predict the optimal time for breeding if a series of samples are taken. If only a single sample is analyzed, progesterone levels above 2 ng/mL generally indicate breeding can begin.

Males are also evaluated for reproductive soundness and ability to breed. In stallions, for example, testosterone levels can be a useful indicator of normal or abnormal reproductive function. Adequate levels of testosterone (and FSH) must be present to stimulate Sertoli cells to create an environment conducive to spermatogenesis. A high value of testosterone (often measured alongside estrone sulfate) indicates the presence of testicular tissue. Another test to measure the testicular function of breeding stallions is the human chorionic gonadotropin (hCG) stimulation test, which helps to determine if testicular tissue is present or absent in cryptorchid horses. A different challenge test, using gonadotropin releasing hormone (GnRH), can be used to assess how responsive the pituitary and testes are to a GnRH challenge. Both tests require the measurement of testosterone in the stallion at specific time intervals after injections.

Equine

Progesterone is important in the regulation of reproductive function in the mare. This steroid hormone regulates uterine activity, aids in the coordination of the estrous cycle, and plays an essential role in the survival of the embryo in pregnant mares. During the estrous cycle and in early pregnancy, progesterone is produced by the corpus luteum, whereas later in the pregnancy it is produced by the placenta. During the estrous cycle, progesterone levels are low, but rise rapidly during the luteal phase once ovulation begins. If pregnancy does not occur, progesterone levels will return to a lower level and the estrous cycle begins again. If pregnancy does occur, the progesterone level will remain high throughout the gestation period until birth. During mid-late gestation, another hormone – estradiol – may be measured to monitor the pregnancy, since low levels can potentially indicate a problem with fetal viability.

Measuring progesterone levels in mares can be useful for distinguishing the different reproductive states as well as monitoring a pregnancy. Accurate measurement of progesterone levels can aid in the management of mare reproduction in the following ways:

- Determine the status of the estrous cycle to plan the most effective reproductive program.
- Measure progesterone during early pregnancy to determine if supplementation is needed.
- Determine the cause of abnormal behavior (e.g. if a mare is always in heat).
- Measure progesterone throughout the entire gestation to determine if supplementation is needed.

Ruminant

Progesterone levels can also be useful for monitoring ovarian status in cattle. Samples are collected frequently at specific intervals and can provide information to detect anestrous cows or monitor response to treatments (e.g. prostaglandins). Measurements of progesterone can also be helpful in differentiating between follicular and luteal cysts or verifying if a corpus luteum is present.

Sheep (and goats) are seasonally polyestrous and typically give birth in the spring. The estrous cycle for a sheep is generally 16-18 days in length and usually begins in late summer. This seasonal breeding pattern leads to a defined lambing period, as well as a seasonal pattern of milk production. By managing this reproductive process, it would be possible to supply product year-round. Progesterone concentrations measured by our immunoassays provide useful information on luteal function to aid in managing this process.

Research in Animal Science using MP Bio Immunoassays

"Alternations in the neonatal lamb leptin surge have been associated with appetite dysregulation in postnatal life where predisposing offspring of MNR and MO ewes exhibit hyperphagia, increased adiposity and weight gain, and hyperleptinemia when subjected to ad libitum feeding challenge (Long et al., 2010; George et al., 2012; Long et al., 2015). Therefore, this study shows that early pregnancy is a specific period of vulnerability for programming of the leptin surge by decreased maternal and fetal nutrition...Plasma cortisol and insulin were measured in duplicate using a commercially available ImmuChem RIA kit (MP Biomedicals, LLC., Solon, OH). Mean intra-assay and interassay CV for cortisol were 8.9% and 9.3%, respectively, with a sensitivity of 10.0 ng/mL. Mean intra-assay and interassay CV for insulin were 12.2% and 8.9%, respectively, with a sensitivity of 5.5 µIU/ mL."

Smith, A.M.; Pankey, C.L.; Odhiambo, J.F.; Ghnenis, A.B.; Nathanielsz, P.W.; Ford, S.P. Reduced maternal nutrition during early- to mid-gestation elevates newborn lamb plasma cortisol concentrations and eliminatesthe neonatal leptin surge. *Journal of Animal Science.* **2018**, *96 (7)*, 2640-2645.

"Reproductive efficiency in cattle impacts production profitability. Estrogen concentrations are critical for follicular maturation and control of estrus behavior. These results indicate that WNT3A administrated during the follicular phase of the estrous cycle can impact reproductive events associated with ovarian estrogen production. The wingless-type mammary-integrated site-signaling pathway may be an important regulator of ovarian dynamics regulated by FSH in vivo...Blood samples were centrifuged 1,500 gravity force for 15 min at 4 °C, serum was decanted and stored at −20 °C, until analysis. Estradiol concentrations were quantified using a commercially available RIA kit (MP Biomedicals, Solon, OH). Detection limit was 95% of maximum binding of the assay was 2 pg/mL. Intra-assay CV was 21% and interassay CV was 23%."

Aloqaily, B.H.; Ferranti, E.M.; Summers, A.F.; Gifford, C.A.; Hernandez Gifford, J.A. Intraovarian WNT3A modulates estrogen-mediated estrus behavior in cattle. *Translational Animal Science.* **2018**, *2*, Issue suppl_1, September 2018, Pages S19–S21.

"In conclusion, provision of a cooled perch system to laying hens ameliorated the stressful effects of combination of stressors...These results suggest that water-chilled perches are an effective cooling method for caged laying hens to improve the efficacy of induced molt under conditions of daily cyclic heat. Commercially available I125 RIA kits were used for determining plasma levels of triiodothyronine (T3) (Catalog # 06B-254,216, MP Biomedicals, Solon, OH), thyroxine (T4) (Catalog # 06B-254,030, MP Biomedicals, Solon, OH), and corticosterone (CORT) (Catalog # 0,712,0103, MP Biomedicals, Solon, OH)."

Hu, J.Y.; Hester, P.Y.; Xiong, Y.; Gates, R.S.; Makagon, M.M.; Cheng, H.W. Effect of cooled perches on the efficacy of an induced molt in White Leghorn laying hens previously exposed to heat stress. *Poultry Science.* **2019**, [ahead of print] pez317.

"LH is essential for dominant follicle growth (Ginther, 2000), oocyte maturation (Hyttel et al., 1989), ovulation, corpus luteum development, and synthesis of P4 (Tomac et al., 2011). These events are critical for establishment and maintenance of pregnancy in domestic animals (Spencer et al., 2004). Therefore, selecting cows with greater capacity for LH secretion under defined conditions could be a strategy to improve fertility in dairy cows...Plasma P4 concentrations were determined in duplicate using a commercial solid-phase, no-extraction RIA (ImmuChem Coated Tube, MP Biomedicals, Costa Mesa, CA)."

Stangaferro, M.L.; Wijma, R.; Masello, M.; Giordano, J.O. Reproductive performance and herd exit dynamics of lactating dairy cows managed for first service with the Presynch-Ovsynch or Double-Ovsynch protocol and different duration of the voluntary waiting period. Journal of Dairy Science. 2017, 101, 2, 1673-1686.

"Pregnancy status was also determined during peri-implantation (day 7 and 19) by analysis of progesterone concentration as per manufacturer's instructions (ImmuChem™ Coated Tube 125 RIA Kit; MP Biomedicals; Costa Mesa, CA, USA; CV < 10%, sensitivity; 0.02 ng/mL) following collection of jugular blood samples (5-10 mL). Heparin treated blood samples were centrifuged (3,000 × g; 15 mins; room temp) before being frozen at -20 °C. Ewes with progesterone concentrations > 1ng/mL were considered pregnant [34]."

Rickard, J. P.; Ryan, G.; Hall, E.; de Graaf, S. P.; Hermes, R. Using transrectal ultrasound to examine the effect of exogenous progesterone on early embryonic loss in sheep. PLOS ONE. 2017, 12, 8.

Veterinary Science Research

Veterinary Scientists aim to understand animal health and disease and apply this knowledge to better care for animals. It explores the habits and care of domesticated and wild animals, which includes topics such as pet health, wildlife conservation and breeding/reproductive management. Veterinary research studies the prevention, control, diagnosis and treatment of diseases of animals, as well as the basic biology, welfare and care of animals.

Reproductive Management

Canine

Progesterone can be used to determine the optimum time of breeding in bitches by predicting the timing of ovulation. Blood sampling can begin as soon as the female has started proestrus. After proestrus, the female will continue into estrus and begin ovulating, leading to an increase in the level of progesterone in the blood. Therefore, progesterone levels can be used to predict ovulation and breeding time.

A female dog is typically diestrous (goes into heat twice per year), although some breeds can have one or three cycles per year. The proestrus is relatively long at 5 to 9 days, while the estrus may last 4 to 13 days. Ovulation occurs 24–48 hours after the luteinizing hormone peaks, which is usually around the fourth day of estrus. This is the best time to begin breeding. Progesterone levels can also be used to diagnose ovarian remnant syndrome.

Hypoluteoidism is a condition in females where insufficient levels of progesterone are present, which can result in loss of a pregnancy. Low or declining levels of progesterone in pregnant females may cause concern for breeders and prompt progesterone supplementation to be prescribed. Our Progesterone RIA kit was used in a study to measure the levels of progesterone that resulted from either intravaginally or orally delivered micronized progesterone to study the overall pharmacokinetics:

> *"Blood samples from each subject were obtained at time points 0, 0.5, 1, 1.5, 2, 4, 6, 8, 12, 24, 36, 48 and 72 hours following one initial dosing of each treatment.* ***Concentrations of plasma progesterone were determined by RIA (ImmuChem Double Antibody, 125I RIA Kit, MP Biomedicals, Costa Mesa, CA).***"
>
> Malbrue, R. A. Pharmacokinetics of Micronized Progesterone Administration in Female Dogs. Louisiana State University Master's Thesis, 2017.

Feline

Cats are considered polyestrous, having multiple estrous cycles throughout their breeding season. They do have a seasonal anestrus during part of the year, depending on certain environmental factors such as temperature and daylight hours. The queen can be bred any time while she is in heat since felines are considered "induced ovulators". This means the queen will generally ovulate any time she is in heat once "provoked", which occurs when sperm triggers an egg to be released. However, spontaneous ovulation has been known to happen in domestic and non-domestic felines, which can make it difficult to determine when a female is ready to be bred. Without ovulation, the queen may go into interestrous before reentering estrus. With the induction of ovulation, the queen either becomes pregnant or goes through a non-pregnant luteal phase, also known as pseudopregnancy.

Spayed felines may display behaviors indicating they are in heat; however, this is most likely due to remnant ovarian tissue left behind, which can still produce estrogen and cause the body to react as if it were in heat. The most widely regarded test for diagnosing ovarian remnant syndrome is a hormone stimulation test. A synthetic hormone is administered while the cat is in heat, and a blood sample is taken 5-7 days later and tested for progesterone. An increase in the level of progesterone indicates the presence of functional ovarian tissue.

Digestive Disorders of the Pancreas and Liver

The pancreas is responsible for controlling blood sugar levels through the secretion of insulin and glucagon hormones. A deficiency in insulin, and therefore the inability to regulate glucose in the bloodstream, results in diabetes mellitus (sugar diabetes). Type I diabetes is caused by the complete destruction of the beta cells that produce insulin, whereas Type II diabetes (which is more common) results from the inability of the body to properly regulate the production or secretion of insulin, or the resistance of the body's tissue to utilize insulin. Hypoglycemia, or "low blood sugar", is often related to diabetes, however it can also be caused by other diseases such as Addison's disease, severe liver disease or tumors of the pancreas.

Insulin levels can also be beneficial to measure if insulinoma is suspected, which is an insulin-secreting mass. Insulinomas are functional neuroendocrine tumors of the beta cells of the pancreas and can occur in many animals, including dogs, cats, and older cattle. The excessive, unregulated insulin production can cause a significant drop in blood glucose levels. If the animal has low blood glucose, high blood insulin, decreased fructosamine and an ultrasound showing a pancreatic mass, the animal can be referred for a biopsy to confirm diagnosis.

In horses, analysis of insulin levels in the blood is the key element for assessing insulin resistance and insulin dysregulation, as well as for aiding in the diagnosis of equine metabolic syndrome (EMS). These tests are either based on the quantitative measurement of basal serum insulin in fasted or non-fasted horses, or increased insulin stimulated by oral or intravenous dynamic diagnostic tests. Increased insulin concentration in horses has been shown to be central to the pathophysiology of endocrinopathic laminitis, a vascular condition of the hoof resulting in severe lameness of the horse.

In dogs, gastrin levels are measured to provide a diagnosis of gastrinoma. Gastrinomas are neuroendocrine tumors that are typically located in the pancreas and can lead to increased production of gastrin. Gastrin ultimately stimulates the secretion of gastric acid, which can cause ulcers and lead to chronic vomiting, weight loss and other clinical signs of upper gastrointestinal disorders. Most healthy dogs will have undetectable levels of serum gastrin; therefore, detecting levels of gastrin in the blood can provide valuable diagnostic information.

If liver disease is suspected, measuring the level of bile acids in the serum provides valuable information. A healthy liver will recycle bile acids and remove them from the bloodstream shortly after they are used to break down fats during digestion. A damaged liver will not effectively perform this function, leading to an increased concentration of bile acids in the blood.

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
Bile Acids, conjugated	RIA (CT)	Serum or Plasma	100	MP06B242918	25 µL	0.2 µmole/L	Human
C-Peptide	IRMA	Serum	100	MP07RK84CT	50 µL	0.105 ng/mL	Human
	EIA / ELISA		96	MP07M61102		0.02 ng/mL	
	ChLIA		96	MP07M2775A		0.025 ng/mL	
Gastrin	RIA (DA)	Serum	100	MP06B255017	200 µL	3.3 pg/mL	Human
			200	MP06B255025			
Glucagon	RIA (DA)	Plasma	50	MP07152101	20 µL	Inquire	Human
Insulin	EIA / ELISA	Serum	96	MP07M60102	50 µL	0.75 µIU/mL	Human
	IRMA		100	MP07RK400CT	100 µL	0.6 µIU/mL	
	ChLIA		96	MP07M2475A	50 µL	0.114 µIU/mL	

*Additional species have been cited in scientific publications.
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.

CT = coated tube DA = double antibody

Thyroid Hormone Testing

The thyroid gland produces many hormones, including Thyroxine (T4) and Triiodothyronine (T3), and controls the metabolic processes in all cells. The function of the thyroid gland is controlled by the hypothalamus and the pituitary gland using a hormone called TSH (Thyroid Stimulating Hormone).

There are two main thyroid disorders: hypothyroidism and hyperthyroidism. Hypothyroidism, which is common in middle-aged dogs, is due to a decreased production of thyroid hormones. This can be caused by inflammation or shrinkage of the thyroid gland, hindering its ability to produce sufficient levels of hormones. When thyroid hormones are overproduced and the overall level of T4 in the body is too high, the resulting condition is called hyperthyroidism, which is commonly seen in older cats. Symptoms of either thyroid disorder are typically systemic and non-specific; therefore, diagnosis by clinical signs alone can be difficult. Measuring the level of T4 in a patient will help to confirm either hypothyroidism or hyperthyroidism diagnosis.

The primary hormone produced by the thyroid gland is T4, and measuring its overall levels in the body provides the most useful indication of overall thyroid function. There is a feedback system between the thyroid gland and the pituitary gland, so that when T4 levels are low, the pituitary will increase TSH production to send a signal to the thyroid to increase T4 production. T4 circulates in the blood either as a free hormone or bound to other blood proteins. In order to measure both free and bound T4, a Total T4 assay should be used. If the Total T4 level is low, or below the normal range, then the patient may have hypothyroidism. A Free T4 test can be used to confirm this diagnosis, since hypothyroidism is the main disorder that can interfere with the levels of Free T4.

Additional information can be collected by measuring the TSH levels of the patient since TSH levels may be increased as the pituitary gland attempts to stimulate the thyroid gland to increase production of T4. If Total T4 levels are noticeably elevated, a diagnosis of hyperthyroidism can be confirmed. If Total T4, Free T4 and TSH levels are normal, hypothyroidism can essentially be ruled out; however, there are some instances when a patient with hyperthyroidism will exhibit T4 levels within the normal range.

Measuring T4 levels can also be useful when an animal is on a thyroid hormone replacement therapy, or if thyroid cancer is suspected and levels of T4 need to be monitored.

Hypothyroidism is known to be heritable, therefore breeders are often interested in this information.

Hypothyroidism testing in dogs	Total T4 and cTSH levels. Free T3 optional if additional info needed.
Hyperthyroidism testing in cats	Only Total T4 levels. Free T4 or Free T3 optional if additional info needed.

MP Bio Immunoassays for Thyroid Hormone Testing

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
T3 (Free)	ChLIA	Serum	96	MP07M1375A	50 µL	0.03 ng/dL	Human
			192	MP07M1375B			
	RIA (CT)	Serum or Plasma	100	MP06B258709	100 µL	0.06 pg/mL	
			500	MP06B258710			
	EIA / ELISA	Serum	96	MP07BC1006	50 µL	0.05 pg/mL	
T3 (Total)	ChLIA	Serum or Plasma	96	MP07M175A	50 µL	0.126 ng/mL	Human
			192	MP07M175B			
	RIA	Serum	100	MP06B254215	100 µL	6.7 ng/dL	
			200	MP06B256447			
			500	MP06B254216			
T3 Uptake	RIA	Serum	100	MP06B237116	25 µL	Inquire	Human
	ChLIA	Serum or Plasma	96	MP07M575A	25 µL		
			192	MP07M575B			
T4 (Free)	ChLIA	Serum	96	MP07M1275A	50 µL	0.03 ng/dL	Human
			192	MP07M1275B			
	RIA (CT)	Serum or Plasma	100	MP06B257214	50 µL	0.045 ng/dL	
			500	MP06B257215			
	EIA / ELISA	Serum	96	MP07BC1008	50 µL	0.05 ng/dL	
T4 (Total)	ChLIA	Serum or Plasma	96	MP07M275A	25 µL	0.1 µg/dL	Human
			192	MP07M275B			
	RIA	Serum or Plasma	100	MP06B254011	25 µL	0.76 µg/dL	
			200	MP06B254029			
			500	MP06B254030			
Thyroid Stimulating Hormone (TSH)	IRMA (CT)	Serum or Plasma	100	MP07294102	200 µL	0.04 µIU/mL	Human
			500	MP07294105			
	RIA	Plasma, Tissue or Cell Culture	120	MP07RK554	100 µL	0.05 ng/tube	Rat
	EIA / ELISA	Serum or Plasma	96	MP07DE9955	100 µL	0.01 ng/mL	Canine
		Serum	96	MP07DE9977	25 µL	0.1 ng/mL	Rat
	ChLIA	Serum	96	MP07M375A	50 µL	0.0062 µIU/mL	Human
			192	MP07M375B			

**Additional species have been cited in scientific publications.*
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.
CT = coated tube DA = double antibody

Adrenal-associated Endocrinopathies

Addison's Disease

Addison's disease, or hypoadrenocorticism, is the reduced production of two hormones from the adrenal gland: cortisol and aldosterone. In most cases, the adrenal gland is being attacked by the body's own immune system because the gland tissue is incorrectly being recognized as foreign, therefore being destroyed. In other, more rare cases, hypoadrenocorticism can be caused by a decreased stimulation of the gland by ACTH (adrenocorticotropic hormone), or by therapeutic interventions used to treat hyperadrenocorticism (Cushing's disease).

Once a complete blood count (CBC) is performed as an initial screening to identify any other disease conditions, an ACTH stimulation test can be performed if Addison's disease is suspected (see below). Natural levels of ACTH in the patient may also be measured to help determine the cause of Addison's disease (see below). Low levels of ACTH indicate a malfunctioning pituitary gland, whereas high levels of ACTH indicate deficient adrenal glands. Aldosterone is typically not measured because it cannot help to distinguish the different causes of Addison's disease.

Cushing's Syndrome

Cushing's syndrome, or hyperadrenocorticism, is associated with excessive cortisol levels in the serum. Typical causes of increased cortisol production by the adrenal glands are: excessive stimulation of the adrenal glands caused by a pituitary tumor or hyperplasia; adrenocortical carcinoma or adenoma; or administration of steroid-containing medications. The clinical signs of Cushing's syndrome progress slowly and are highly variable; therefore, diagnosis by clinical symptoms alone is difficult. Once an initial screening is completed and Cushing's syndrome is suspected, more extensive and specific tests are required to confirm the disease. This is generally accomplished by manipulating the pituitary-adrenal axis using either a dexamethasone suppression or ACTH stimulation test.

"Validation of the [MP Bio/ICN] RIA for ACTH revealed intra-assay coefficients of variation of 7.1%, 8.8%, and 5.8% for samples containing high, medium, and low concentrations of ACTH, respectively (Table 2)."

Couëtil, L.; Paradis, M. R.; Knoll, J. Plasma Adrenocorticotropin Concentration in Healthy Horses and in Horses with Clinical Signs of Hyperadrenocorticism. *Journal of Veterinary Internal Medicine.* **1996**, *10*, 1, 1-6.

Dexamethasone Suppression Test

Dexamethasone (synthetic cortisol) is an exogenous steroid that signals the pituitary gland to suppress the secretion of ACTH, mimicking the natural negative feedback loop caused by increased levels of cortisol. When healthy animals are injected with dexamethasone, ACTH and cortisol production is suppressed. In patients with Cushing's syndrome, this negative feedback loop is either lost or diminished because cortisol levels are always elevated. If the origin of Cushing's syndrome is due to the adrenal gland, the negative feedback mechanism is completely lost, so there will be no reduction in cortisol levels after injection of dexamethasone. If the origin of the disorder is due to the pituitary gland, the negative feedback loop is only diminished, and a slight decrease in the cortisol level is expected after the injection. Therefore, the Dexamethasone Suppression Test is useful for confirming Cushing's syndrome, as well as distinguishing the origin.

ACTH Stimulation Test

For the ACTH Stimulation test, ACTH is injected into the patient to stimulate the adrenal glands to produce cortisol, similar to the body's natural pathway. The idea of this test is to demonstrate the ability of the animal's adrenal glands to produce cortisol. A blood sample is taken before and after the injection, and the level of cortisol is measured in both and compared. If a significant increase in cortisol levels is observed, this is highly indicative of Cushing's syndrome. This is because the adrenal glands have been overstimulated by natural ACTH due to the disorder, so they are highly responsive to the synthetic ACTH. On the other hand, if little or no increase in cortisol levels is detected, the patient is showing a lack of response to ACTH stimulation, confirming the diagnosis of Addison's disease. The confirmation of Cushing's syndrome by the ACTH stimulation test is unable to distinguish the origin of the disorder (adrenal or pituitary), and some animals with Cushing's syndrome will be unresponsive to this test. Patients displaying clinical signs of Cushing's syndrome due to steroid therapy will actually show a very mild (or no) response to this test, confirming iatrogenic Cushing's syndrome.

Endogenous ACTH Serum Test

Natural levels of ACTH in the animal may also be measured to help screen for Cushing's syndrome; however, the results may not clearly confirm diagnosis on its own. In general, increased levels of ACTH indicate a malfunctioning pituitary gland, whereas low levels of ACTH indicate adrenal or iatrogenic Cushing's syndrome. However, the levels may overlap and give ambiguous results. A combination of these tests mentioned above will either allow a diagnosis to be confirmed or will help to rule out this disorder in the patient.

MP Bio Immunoassays for Adrenal-associated Endocrinopathy Testing

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
17α-hydroxyprogesterone	RIA (CT)	Serum or Plasma	100	MP07271102	25 µL	Inquire	Human
			500	MP07271105			
	RIA (DA)		100	MP07171102		0.08 ng/mL	
	ChLIA		96	MP07M5275A		0.040 ng/mL	
ACTH	RIA (DA)	Plasma	50	MP07106101	100 µL	5.7 pg/mL	Human
			100	MP07106102			
Corticosterone	EIA / ELISA	Serum or Plasma	96	MP07DE9922	10 µL	4.1 ng/mL	Rat, Mouse
	RIA (DA)		100	MP07120102		Inquire	
			200	MP07120103			
Cortisol	EIA / ELISA	Serum	96	MP07M21602	25 µL	91.5 pg	Human
			2 x 96	MP07M21603			
	ChLIA	Serum or Plasma	96	MP07M3675A	25 µL	0.27 µg/dL	

**Additional species have been cited in scientific publications.*
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.
CT = coated tube DA = double antibody

Plasma prolactin and adrenocorticotropin responses to thyrotropin releasing hormone in mares treated with detomidine and butorphanol

ACTH

CASE STUDY

Erin L. Oberhaus[a], Donald L. Thompson, Jr.[a], Lauren E. Kerrigan[a] and Ann M. Chapman[b]

[a] School of Animal Sciences, Louisiana Agricultural Experiment Station, LSU AgCenter, Baton Rouge, LA, USA
[b] Department of Veterinary Clinical Science, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA, USA

Introduction

Stimulation and/or suppression tests are routinely used in equine veterinary medicine to evaluate for endocrine disease (e.g. insulin sensitivity, EMS, PPID). Many endocrine responses are subject to perturbations during times of excitement or stress; therefore, these endocrine tests often require the horse to be calm. Sedation may be necessary for certain diagnostic procedures or if the animal is overly fractious. Use of detomidine and butorphanol to produce sedation and analgesia are commonplace in equine practices, but their effects on endocrine responses to secretagogues are largely unknown. The current recommended test for early pituitary pars intermedia dysfunction is to assess the ACTH response to a standard dose of TRH (Frank et al. 2015). Thyrotropin-releasing hormone is a known stimulator of prolactin and ACTH (Arana Valencia et al. 2013). Horses diagnosed with early PPID will have an exaggerated response to TRH stimulation. A reduction in plasma ACTH has been reported in horses administered clonidine, an alpha2 adrenergic agonist (Alexander and Irvine, 2000), but the effects of these drugs on the ACTH response to TRH have not been described. Information regarding the effects of alpha adrenergic agonists and/or opioids on circulating prolactin and ACTH is sparse. Administration of the opioid antagonist, naloxone, failed to alter plasma prolactin concentrations in diestrous mares (Aurich et al. 2000), but increased it dramatically in pregnant mares (Aurich et al. 2001). Evaluating the effects of detomidine and butorphanol on basal prolactin concentrations as well as the prolactin and ACTH responses to TRH would be the first report of these in horses.

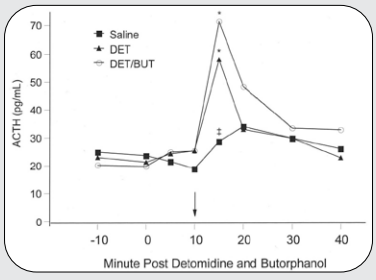
Materials & Methods – ACTH Assay

Frozen plasma samples were thawed and analyzed for prolactin and ACTH. Commercially available reagents were used to measure ACTH (MP Biomedicals, Santa Ana, CA) as previously described and validated (Arana Valencia et al. 2013).

Analyte	Assay Type	Sample Type	Tests	Cat. No.
ACTH	RIA (DA)	Plasma	50	MP07106101
			100	MP07106102

Results

Plasma prolactin increased ($P < .001$) after TRH in all groups, slowly over 30 min in control mares, but rapidly peaking at 5 min in DET and DET/BUT treated mares. Plasma prolactin in DET-treated mares returned to pretreatment concentrations 20 min post TRH, whereas they remained stimulated ($P \leq .05$), albeit lower than controls, in DET/BUT-treated mares for 30 min. Mean resting ACTH concentrations were < 30 pg/mL for all treatments. A peak rise in ACTH was observed in DET and DET/BUT-treated mares 5 min after administration of TRH, whereas a peak rise was observed in control mares 10 min post TRH and was almost 2-fold lower ($P = 0.05$) than the peak observed in DET and DET/BUT-treated mares. Post-treatment, but pre-TRH, ACTH concentrations were not affected by DET or DET/BUT.



Mean plasma ACTH responses to 1 mg TRH (arrow) in mares pre-treated with saline, detomidine (DET), or detomidine combined with butorphanol (DET/BUT). Means with different symbols differ at $P < .05$. Pooled SEM was 15.1 pg/mL.

"We have validated several MP RIAs for equine and bovine endocrinology studies and routinely use them in our research. We know we're getting a quality assay that produces repeatable and reliable results. Ordering is effortless and kits are received in a timely manner. We will choose MP assays as long as they are available!"

–Dr. Erin Oberhaus, Assistant Professor at Louisiana State University

Conclusion

1. Resting concentrations of prolactin and ACTH were not affected by detomidine or detomidine combined with butorphanol.
2. TRH stimulated prolactin and ACTH in all treated mares.
3. Detomidine and detomidine combined with butorphanol attenuated the prolactin response to TRH.
4. Detomidine and detomidine combined with butorphanol potentiated the ACTH response to TRH.
5. Use of these compounds for sedation may not be advisable for obtaining reliable plasma ACTH concentrations in response to TRH.
6. Use of these compounds could be used to obtain reliable resting plasma concentrations of ACTH within 10 minutes of sedation.

MP Bio Immunoassays for Animal Research

Analyte	Assay Type	Tests	Cat. No.	Species*
17α-hydroxyprogesterone	RIA (CT)	100	MP07271102	Human
		500	MP07271105	
	RIA (DA)	100	MP07171102	
	ChLIA	96	MP07M5275A	
ACTH	RIA (DA)	50	MP07106101	Human
		100	MP07106102	
Androstenedione	RIA (DA)	100	MP07109202	Human
Bile Acids, conjugated	RIA (CT)	100	MP06B242918	Human
Corticosterone	EIA / ELISA	96	MP07DE9922	Rat, Mouse
	RIA (DA)	100	MP07120102	
		200	MP07120103	
Cortisol	EIA/ELISA	96	MP07M21602	Human
		2 x 96	MP07M21603	
	ChLIA	96	MP07M3675A	
C-Peptide	IRMA	100	MP07RK84CT	Human
	EIA / ELISA	96	MP07M61102	
	ChLIA	96	MP07M2775A	
E2 (17βEstradiol)	RIA (CT)	100	MP07238102	Human
		500	MP07238105	
	RIA (DA)	100	MP07138102	
		500	MP07138105	
	ChLIA	96	MP07M4975A	
Follicle Stimulating Hormone (FSH)	RIA	120	MP07RK550	Rat
	ChLIA	96	MP07M475A	Human
		192	MP07M475B	
Gastrin	RIA (DA)	100	MP06B255017	Human
		200	MP06B255025	
Glucagon	RIA (DA)	50	MP07152101	Human
Growth Hormone (GH)	RIA	120	MP07RK551	Rat
	ChLIA	96	MP07M1775A	Human
hCG	ChLIA	96	MP07M875A	Human
		192	MP07M875B	
Insulin	EIA / ELISA	96	MP07M60102	Human
	IRMA	100	MP07RK400CT	
	ChLIA	96	MP07M2475A	
Luteinizing Hormone (LH)	RIA	120	MP07RK552	Rat
	ChLIA	96	MP07M675A	Human
		192	MP07M675B	
Progesterone	RIA (CT)	100	MP07270102	Human
		500	MP07270105	
	RIA (DA)	100	MP07170102	
		500	MP07170105	
		96	MP07DE9988	Rat, Mouse
	ChLIAv	96	MP07M4875A	Human
Prolactin	RIA	120	MP07RK553	Rat
	EIA / ELISA	96	MP07DE9944	Canine
		96	MP07DE9966	Rat
	ChLIA	96	MP07M775A	Human
		192	MP07M775B	

Analyte	Assay Type	Tests	Cat. No.	Species*
Testosterone	EIA / ELISA	96	MP07DE9911	Rat, Mouse
	RIA (DA)	100	MP07189102	Human
		500	MP07189105	
	ChLIA	96	MP07M3775A	
T3 (Free)	ChLIA	96	MP07M1375A	Human
		192	MP07M1375B	
	RIA (CT)	100	MP06B258709	
		500	MP06B258710	
	EIA / ELISA	96	MP07BC1006	
T3 (Total)	ChLIA	96	MP07M175A	Human
		192	MP07M175B	
	RIA	100	MP06B254215	
		200	MP06B256447	
		500	MP06B254216	
T3 Uptake	RIA	100	MP06B237116	Human
	ChLIA	96	MP07M575A	
		192	MP07M575B	
T4 (Free)	ChLIA	96	MP07M1275A	Human
		192	MP07M1275B	
	RIA (CT)	100	MP06B257214	
		500	MP06B257215	
	EIA / ELISA	96	MP07BC1008	
T4 (Total)	ChLIA	96	MP07M275A	Human
		192	MP07M275B	
	RIA	100	MP06B254011	
		200	MP06B254029	
		500	MP06B254030	
Thyroid Stimulating Hormone (TSH)	IRMA (CT)	100	MP07294102	Human
		500	MP07294105	
	RIA	120	MP07RK554	Rat
	EIA / ELISA	96	MP07DE9955	Canine
		96	MP07DE9977	Rat
	ChLIA	96	MP07M375A	Human
		192	MP07M375B	
Vitamin B12, Folate - SNB	RIA	100	MP06B257117	Human
		200	MP06B264806	
2-CAT Fast Track [Adrenaline (Epinephrine) and Noradrenaline (Norepinephrine)]	EIA / ELISA	2 x 96	MP07LE6500	Human
	RIA	100	MP07LR6500	
Adrenaline (Epinephrine) Fast Track	EIA / ELISA	96	MP07LE6100	Human
Noradrenaline (Norepinephrine) Fast Track	EIA / ELISA	96	MP07LE6200	Human

**Additional species have been cited in scientific publications. All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.*

CT = coated tube DA = double antibody

AlbumiNZ™ Bovine Serum Albumin (BSA)

A superlative BSA for every application

MP Bio produces various grades of BSA at its state-of-the-art manufacturing facility in Auckland, New Zealand, to suit different applications, including Low IgG, Ultra-low IgG, Low Endotoxin, Protease Reduced, Low Free Fatty Acid, and Microbiological grade BSA. All these grades can be gamma irradiated based on customer needs. The IgG and Free Fatty Acid limits in our Low IgG and Low Free Fatty Acid BSA, respectively, is among the lowest in industry!

- Bovine Plasma sourced only from within New Zealand, with no BSE or List A animal diseases present
- Chromatographic extraction ensures high purity, intact proteins processed without the compromising effects of traditional methods
- Assured and secure supply chain
- An ISO 9001 certificate and Quality Systems audited to cGMP principles ensure the highest level of process control, consistent product quality and complete traceability
- Highly flexible operations to enable better product mix and customized product offerings

The Microbiological grade BSA is particularly suited for animal health research due to the following features:

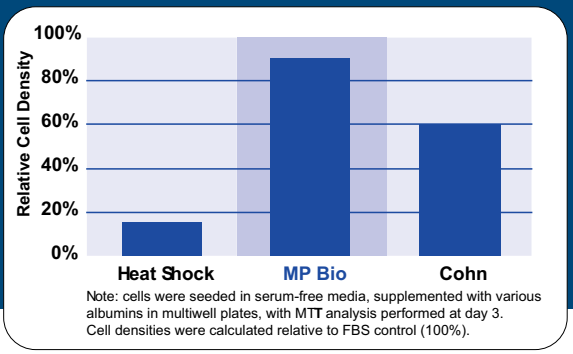
Low endotoxin and protease limits	High lipid content	Very low ammonium ion content	Pack sizes from 10 g–5 kg

Description	Size	Cat. No.
AlbumiNZ™ Microbiological Grade BSA	10 g	MP218062010
	25 g	MP218062025
	50 g	MP218062050
	100 g	MP218062080
	500 g	MP218062090
	1 kg	MP218062091

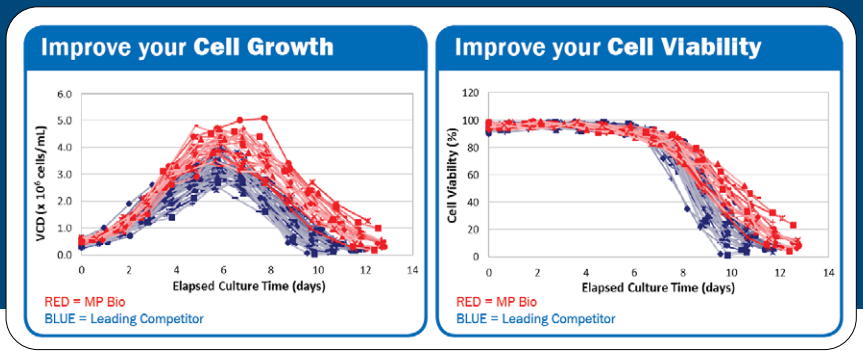
Not all BSA is the same

AlbumiNZ is produced using the Chromatographic Extraction process and has distinct advantages over BSA produced using traditional methods:

- ✓ Lipid-rich protein
- ✓ Good lot-to-lot consistency
- ✓ Enhanced cell nutrition
- ✓ Greater cell number yield



Superior growth rates in cell culture (CHO and SP2/O cells) using MP Bio BSA, compared to BSA produced from traditional methods.



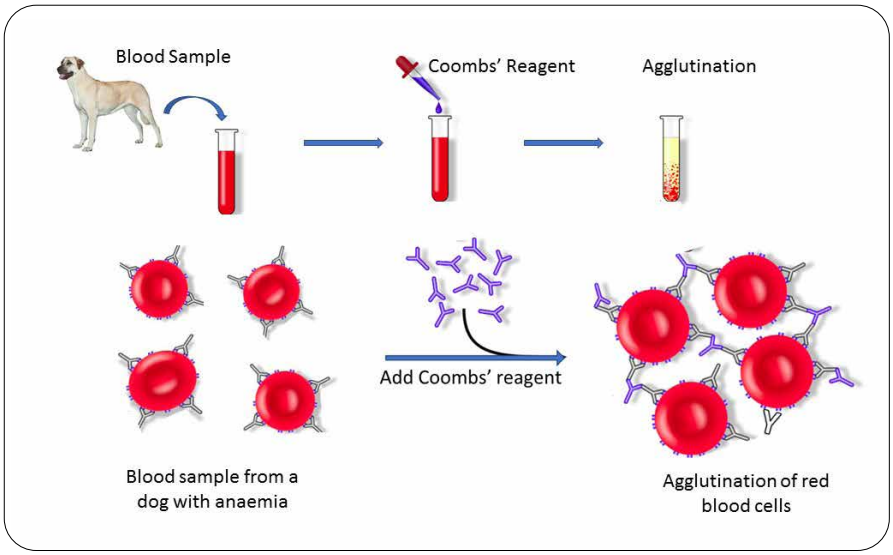
This evaluation was done by a prominent global biopharma company for a life-saving drug. The scale of the bioreactor was 10,000 L and the processed cell line was a murine myeloma NS0.

Sensitive and Specific Coombs' Test (Anti-Globulin) for Animal Studies

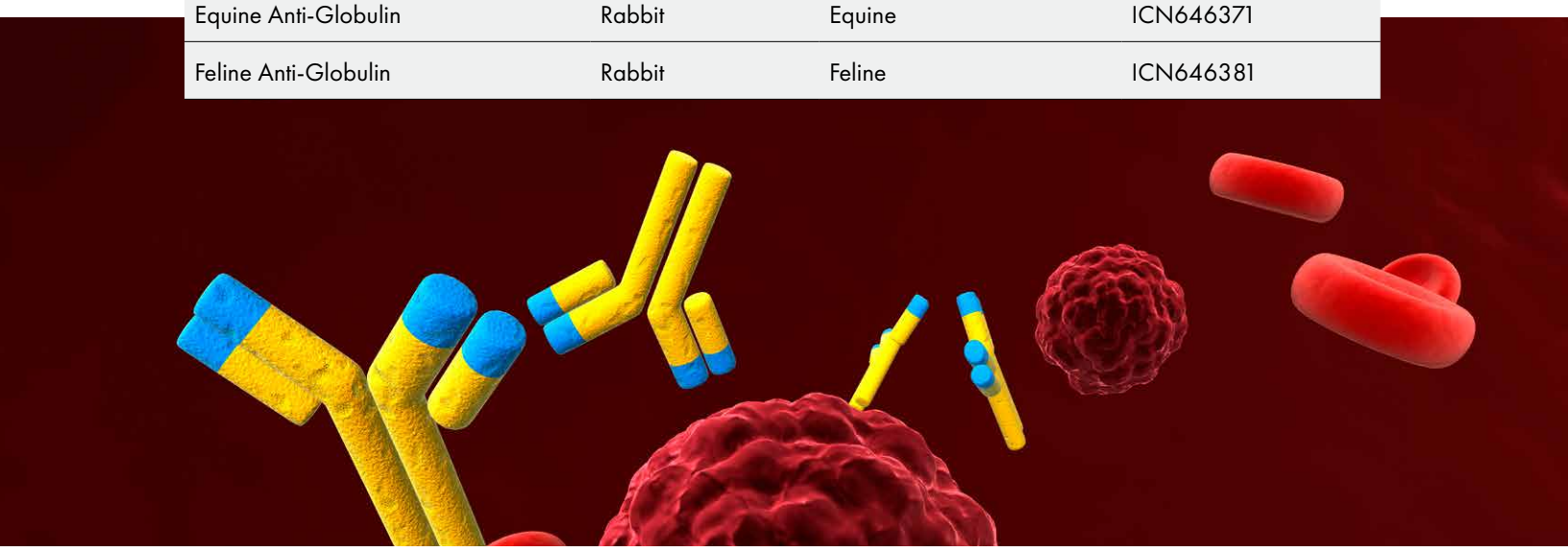
Coombs' test is used in research laboratories to screen animals with autoimmune disorders and to develop models for autoimmune diseases. Blood agglutination in the test is a visual positive indication of these diseases, especially immune-mediated hemolytic anemia (IMHA).

With over 50 years industry experience, MP Bio has long been providing scientists and researchers with high quality and reliable Coombs' tests (research use only) that feature:

- Species-specific antibodies for canine, equine, and feline
- Sensitivity to immunoagglutination to IgG, IgM and C3
- Lyophilized powder for extended shelf life and more efficient storage
- Simple reconstitution - diluted with buffer
- Versatility using multiple test platforms



Description	Host	Target	Cat. No.
Canine Anti-Globulin	Rabbit	Canine	ICN646351
Equine Anti-Globulin	Rabbit	Equine	ICN646371
Feline Anti-Globulin	Rabbit	Feline	ICN646381



Laboratory Animal Science and Other Animal Models in Research

The use of animal models in research over the last few centuries has been critical to the vast knowledge we have today of numerous human conditions and diseases. Animal models give us the ability to conduct breakthrough scientific research leading to discoveries in all areas of human physiology, including diagnosis and treatment of many diseases. Since Pavlov's Dogs and Classical Conditioning in the late 1800's, to the next breakthrough cancer treatment of tomorrow, research in animal models has benefitted humans, as well as animals, by greatly improving our understanding of biological processes and discovering ways to improve the quality of life for all creatures. From reproductive management to measuring stress levels, our Immunoassays provide you with the accurate data you need, every time.

Typical Laboratory Animals include mice, rats, hamsters, guinea pigs, rabbits and dogs; however, other animals are becoming more standardized in research as well, such as other mammals, birds, fish and non-human primates. Many of our immunoassay tests are designed for use with human samples, but most analytes are not species-specific. Analytes such as steroid hormones (cortisol, progesterone, testosterone), thyronines (T3, T4) and small molecule peptides (insulin, ACTH) are similar across many animal species and can be measured successfully using our immunoassay kits intended for human samples.

Animal Applications for Human Diagnostic Kits - Feasibility Checklist

- **Does the diagnostic range of the analyte you are measuring fall within the standard curve range of the kit?** Dilution of the sample may be necessary (too high), or the expected value may fall below the first standard level. The addition of a lower standard (diluting the first kit standard) may be possible with certain assay systems where there is room for enhanced sensitivity in the standard curve.
- **What is the sample size required in the assay?** This can be an issue when working with small animals.
- **Is the analyte you want to measure species-specific?** For steroids (ex: Progesterone, Testosterone, etc.) and thyronines (T3, T4, etc.) this is NOT an issue. They are not species-specific and will be equally recognized by the kit antibody regardless of the source of the sample to be tested. For polypeptides (ex: LH, FSH, TSH) there may differences between species, making adaptations for alternate, nonhuman uses difficult.
- **Will there be unexpected cross-reactivity issues?** There may be other substances (steroids, for example) that are similar in structure to the analyte of interest in the animal sample. Those substances may be present at higher concentrations than seen in humans, resulting in increased "cross-reaction". This may affect the accuracy of the result.
- **Are there matrix issues?** The matrix (serum/plasma base of the sample) may be quite different in its protein make up from human serum. This may cause the animal sample to behave differently than a human sample would, producing inaccurate or unreliable results. Matrix issues are one of the most common obstacles in adapting human kits for animal use.

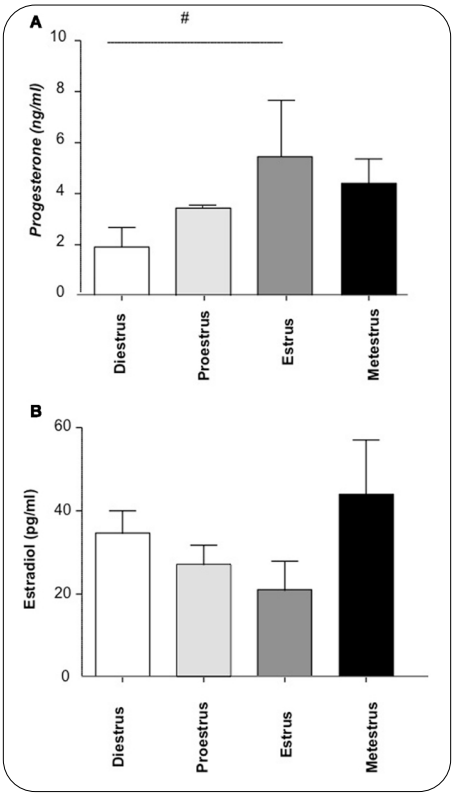
Reproductive Hormone Testing in Laboratory Animals

Rats, mice and hamsters have rapid estrous cycle times of 4 to 6 days, with estrus lasting <1 day. Although they ovulate spontaneously, they do not develop a fully functioning corpus luteum unless they receive coital stimulation. Fertile mating leads to pregnancy, and infertile mating leads to a state of pseudopregnancy lasting approximately 10 days.

While visual observation of the rodent vagina is typically the quickest method to determine estrus status in timed breeding, quantitative measurement of steroid hormones can help to provide a quantitative value when more detailed information is needed. The accurate measurement of sex steroids in rodents is also useful in the study of disorders such as breast cancer, prostate cancer, osteoporosis, polycystic ovary syndrome and cardiovascular diseases.

Rat Estrous Cycle	
Length of Estrous Cycle (avg.)	4.8 days
Proestrus	12-14 hours
Estrus	25-27 hours
Metestrus	6-8 hours
Diestrus	55-57 hours

Westwood, F. R. *Toxicologic Pathology*. **2008**, 36, 3.



Zenclussen, M.; Casalis, P.; Jensen, F.; Woidacki, K.; Zenclussen, A. *Front. Endocrinol*. **2014**, *5*, 32.

MP Bio Corticosterone RIA Kit for Stress Research

- **Highly sensitive***
- **Simple and convenient compared with HPLC or GC-MS**
- **Flexible** – Various animal model references (rodents, avian, marine, amphibian, reptiles, non-human primates and many more!)
  – Double antibody method able to accommodate different sample types
- **Efficient** – uses unextracted serum or plasma, no protein denaturation step required
- **Outstanding reliability for decades** – over 2,000 publications
- **Unparalleled technical support to guide you through your assay**

Description	Size	Cat. No.
Corticosterone RIA Kit	100 Tubes	MP07120102
	200 Tubes	MP07120103

MP Bio Corticosterone Radioimmunoassay Outperforms 3 ELISA Assays

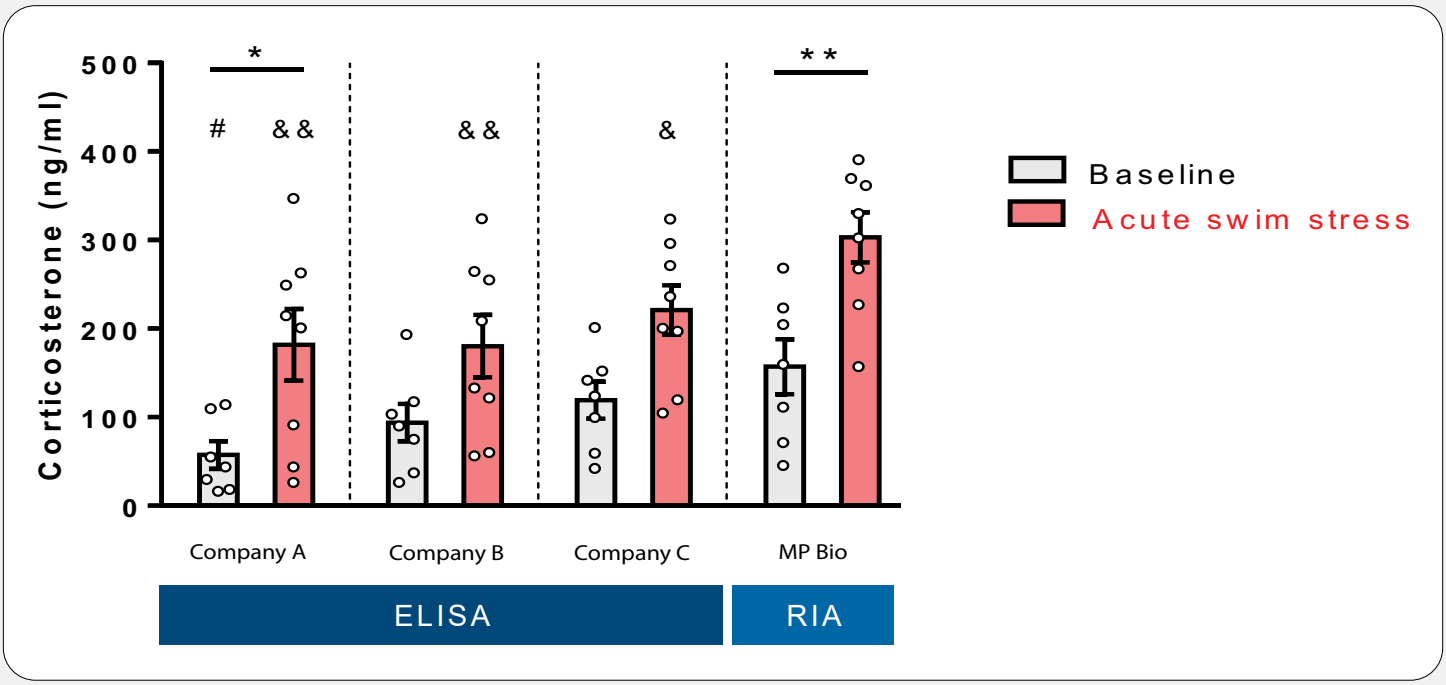


*Figure 1. "...Multiple comparisons showed that **at baseline, the RIA kit yielded significantly higher corticosterone concentrations** compared to Company Aassay (#, $p < .05$). **In the acute stress condition, the RIA kit also yielded significantly greater concentrations** compared to Company A [(&&, $p < .0001$),B (&&, $p < .0001$), and C assays (&, $p < .01$), respectively]..." Bekhbat, M.; Glasper E. R.; Rowson, S. A.; Neigh, G. N. Measuring corticosterone concentrations over a physiological dynamic range in female rats. *Physiol. Behav.* **2018**, *194*, 73–76.

MP Bio Immunoassays for Stress Research

Analyte	Assay Type	Sample Type	Tests	Cat. No.	Sample Vol.	Sensitivity	Species*
ACTH	RIA (DA)	Plasma	50	MP07106101	100 µL	5.7 pg/mL	Human
			100	MP07106102			
Corticosterone	EIA / ELISA	Serum or Plasma	96	MP07DE9922	10 µL	4.1 ng/mL	Rat, Mouse
	RIA (DA)		100	MP07120102		Inquire	
			200	MP07120103			
Cortisol	RIA (CT)	Serum or Plasma	100	MP07221102	25 µL	0.17 µg/dL	Human
			500	MP07221105			
			1000	MP07221106			
	EIA / ELISA	Serum	96	MP07M21602		91.5 pg	
	ChLIA	Serum or Plasma	96	MP07M3675A		0.27 µg/dL	
Growth Hormone (GH)	RIA	Plasma, Tissue or Cell Culture	120	MP07RK551	100 µL	0.16 ng/tube	Rat
	ChLIA	Serum	96	MP07M1775A	50 µL	0.118 µIU/mL	Human
Prolactin	RIA	Plasma, Tissue or Cell Culture	120	MP07RK553	100 µL	0.07 ng/tube	Rat
	EIA / ELISA	Serum	96	MP07DE9944	25 µL	0.4 ng/mL	Canine
			96	MP07DE9966		0.6 ng/mL	Rat
	ChLIA		96	MP07M775A	25 µL	0.8 ng/mL	Human
2-CAT Fast Track [Adrenaline (Epinephrine) and Noradrenaline (Norepinephrine)]	EIA / ELISA	Plasma or Urine	2 x 96	MP07LE6500	10 or 300 µL	Adrenaline: 0.01 ng/mL plasma, 0.9 ng/mL urine Noradrenaline: 0.036 ng/mL plasma, 1.7 ng/mL urine	Human
	RIA	Plasma or Urine	100	MP07LR6500	10 or 300 µL	Adrenaline: 19 pg/mL plasma, 0.39 ng/mL urine Noradrenaline: 42 pg/mL plasma, 1.1 ng/mL urine	Human
Adrenaline Fast Track	EIA / ELISA	Plasma or Urine	96	MP07LE6100	10 or 300 µL	Plasma: 0.01 ng/mL Urine: 0.9 ng/mL	Human
Noradrenaline (Norepinephrine) Fast Track	EIA / ELISA	Plasma or Urine	96	MP07LE6200	10 or 300 µL	Plasma: 0.036 ng/mL Urine: 1.7 ng/mL	Human

**Other species have been cited in scientific publications.*
All kits are available for research use. Some kits may be cleared for IVD use. Contact us for more information.
CT = coated tube DA = double antibody

Hundreds of species validated using the MP Bio Corticosterone RIA Kit

"We measured plasma corticosterone concentrations in each individual blood sample using a commercially available corticosterone I^{125} radioimmunoassay kit (Cat. #07-120102, ICN Biomedicals, Costa Mesa, California)...We conducted parallelism and recovery of exogenous corticosterone validation assays on two pooled plasma samples (low and high; each pool consisted of plasma from five individuals) from each bird species to validate plasma corticosterone RIA utility, accuracy, and precision (Jeffcoate 1981)."

Washburn, B. E.; Morris, D. L.; Millspaugh, J. J.; Faaborg, J.; Schulz, J. H. Using a commercially available radioimmunoassay to quantify corticosterone in avian plasma. *Condor*. **2002**, *104*, 558–563.

"Levels of plasma CORT were determined in 17 assays using double-antibody radioimmunoassay kits (Catalog # 07–102103, MP Biomedical, Orangeburg, NY, USA) that had already been validated for use in our study system [32]...Therefore, from our data it is apparent that garter snakes of the slow-living ecotype are exposed to overall higher levels of circulating glucocorticoids – both baseline and stressed-induced – than garter snakes of the fast-living ecotype. Our study, thus, shows an association between glucocorticoid levels and pace of life in a reptilian system, as has been recently documented for birds [4,15], supporting the possible role of glucocorticoids as mediators of life-history trade-offs in this vertebrate group."

Palacios, M. G.; Sparkman, A. M.; Bronikowski, A. M. Corticosterone and pace of life in two life-history ecotypes of the garter snake Thamnophis elegans. *General and Comparative Endocrinology*. **2012**, *175*, 3, 443-448.

"Serum corticosterone was analyzed using a radioimmunoassay and protocol from MP Biomedicals (Orangeburg, NY, USA).... Increased levels of corticosterone are well known to inhibit hippocampal neurogenesis [8,9] and adrenalectomy increases the number of surviving newborn neurons [10], supporting a role for corticosterone in regulating hippocampal neurogenesis."

Lindqvist, A.; Mohapel, P.; Bouter, B.; Frielingsdorf, H.; Pizzo, D.; Brundin, P.; Erlanson-Albertsson, C. High-fat diet impairs hippocampal neurogenesis in male rats. *European Journal of Neurology*. **2006**, *13*, 1385-1388.

"Corticosterone was determined by double antibody radioimmunoassay (125I-RIA, MP Biomedicals, 07-120103) with modifications validated for several avian species (Washburn et al. 2002; Newman et al. 2008; Schmidt and Soma 2008)... In summary, we found that experimental manipulation of plasma corticosterone had a positive effect on foraging behavior, which resulted in direct increases in chick growth even in females that were pushed toward very high levels and had temporarily suspended foraging activity."

Crossin, G. T.; Trathan, P. N.; Phillips, R. A.; Gorman, K. B.; Dawson, A.; Sakamoto, K. Q.; Williams, T.D. Corticosterone Predicts Foraging Behavior and Parental Care in Macaroni Penguins. *The American Naturalist*. **2012**, *180*, 1, E31-E41.

"Faecal extracts were also analysed using a double-antibody 125I-labelled corticosterone RIA (MP Biomedicals, Orangeburg, NY, USA), previously validated for jaguar faeces (Conforti et al., 2012), according to the manufacturer's instructions, except that all reagent volumes were halved... The biological validity of the corticosterone RIA is further supported by the results of a previous study of captive jaguars that were challenged with exogenous adrenocorticotrophic hormone (Conforti et al., 2012)."

Mesa-Cruz, J. B.; Brown, J. L.; Kelly, M. J. Effects of natural environmental conditions on faecal glucocorticoid metabolite concentrations in jaguars (Panthera onca) in Belize. *Conserv Physiol*. **2014**, *2*, 1.

Stress Research References

Adrenaline – Human

Cuevas-Ramos D.; Almeda-Valdés P.; Meza-Arana C. E.; et al. Exercise increases serum fibroblast growth factor 21 (FGF21) levels. *PLoS ONE*. **2012**, *7*, 5.

Corticosterone - Avian

Newman, A. E. M.; Chin, E. H.; Schmidt, K. L.; Bond, L.; WynneEdwards, K. E.; Soma, K. K. Analysis of steroids in songbird plasma and brain by coupling solid phase extraction to radioimmunoassay. *General and Comparative Endocrinology*. **2008**, *155*, 503–510.

Washburn, B. E.; Morris, D. L.; Millspaugh, J. J.; Faaborg, J.; Schulz, J. H. Using a commercially available radioimmunoassay to quantify corticosterone in avian plasma. *Condor*. **2002**, *104*, 558–563.

Corticosterone – Buffalo

Spaan, J. M.; Pitts, N.; Buss, P.; Beechler, B.; Ezenwa, V. O.; Jolles, A. E. Noninvasive measures of stress response in African buffalo (*Syncerus caffer*) reveal an age-dependent stress response to Immobilization. *Journal of Mammalogy*. **2017**, *98*, *5*, 1288–1300.

Corticosterone – Chicken

Alba, A. C.; Strauch, T.A.; Keisler, D. H.; Wells, K. D.; Kesler, D. C. Using a keratinase to degrade chicken feathers for improved extraction of glucocorticoids. *Gen Comp Endocrinol*. **2019**, *270*, 35-40.

Corticosterone – Jaguar

Mesa-Cruz, J. B.; Brown, J. L.; Kelly, M. J. Effects of natural environmental conditions on faecal glucocorticoid metabolite concentrations in jaguars (*Panthera onca*) in Belize. *Conserv Physiol*. **2014**, *2*, 1.

Corticosterone – Mice

Araujo, P.; Coelho, C. A.; Oliveira, M. G.; Tufik, S.; Andersen, M. L. Neonatal Sleep Restriction Increases Nociceptive Sensitivity in Adolescent Mice. *Pain Physician*. **2018**, *21*, E137-E148.

Berry, A.; Bellisario, V.; Panetta, P.; Raggi, C.; Magnifico, M. C.; Arese, M.; Cirulli, F. Administration of the Antioxidant N-Acetyl-Cysteine in Pregnant Mice Has Long-Term Positive Effects on Metabolic and Behavioral Endpoints of Male and Female Offspring Prenatally Exposed to a High-Fat Diet. *Frontiers in Behavioral Neuroscience*. **2018**, *12*, 48.

Corticosterone – Mice - *cont.*

Gotthardt, J. D.; Verpeut, J. L.; Yeomans, B. L.; Yang, J. A.; Yasrebi, A.; Roepke, T. A.; Bello, N. T. Intermittent Fasting Promotes Fat Loss With Lean Mass Retention, Increased Hypothalamic Norepinephrine Content, and Increased Neuropeptide Y Gene Expression in Diet-Induced Obese Male Mice. *Endocrinology*. **2015**, *157, 2*, 679-91.

Kong, F.; Laryea, G.; Liu, Z.; Bhattacharyya, S. Transforming growth factor-β-activated kinase 1 resistance limits glucocorticoid responsiveness to Toll-like receptor 4-mediated inflammation. *Immunology*. **2015**, *145, 1*, 136-49.

Li, L.; Li, X.; Zhou, W.; Messina, J. L. Acute psychological stress results in the rapid development of insulin resistance. *The Journal of Endocrinology*. **2013**, *217, 2*, 175-84.

Hirotsu, C.; Rydlewski, M.; Araújo, M. S.; Tufik, S.; Andersen, M. L. Sleep loss and cytokines levels in an experimental model of psoriasis. *PloS ONE*. **2012**, *7, 11*, e51183.

Alonso, L. C.; Yokoe, T.; Zhang, P.; Scott, D. K.; Kim, S. K.; O'Donnell, C. P.; Garcia-Ocaña, A. Glucose infusion in mice: a new model to induce beta-cell replication. *Diabetes*. **2007**, *56, 7*, 1792-801.

Corticosterone – Parrot

Young, A. M.; Hallford, D. M. Validation of a fecal glucocorticoid metabolite assay to assess stress in the budgerigar (*Melopsittacus undulatus*). *Zoo Biology*. **2012**, *32, 1*, 112-6.

Corticosterone – Penguin

Crossin, G. T.; Trathan, P. N.; Phillips, R. A.; Gorman, K. B.; Dawson, A.; Sakamoto, K. Q.; Williams, T.D. Corticosterone Predicts Foraging Behavior and Parental Care in Macaroni Penguins. *The American Naturalist*. **2012**, *180, 1*, E31-E41.

Corticosterone – Primate

Foerster, S.; Cords, M.; Monfort, S. L. Seasonal Energetic Stress in a Tropical Forest Primate: Proximate Causes and Evolutionary Implications. *PLoS ONE*. **2012**, *7, 11*, e50108.

Stress Research References - *cont.*

Corticosterone – Rat

Morano, R.; Hoskins, O.; Smith, B. L.; Herman, J. P. Loss of Environmental Enrichment Elicits Behavioral and Physiological Dysregulation in Female Rats. *Front. Behav. Neurosci.* **2019**, *12*, 287.

Bekhbat, M.; Glasper E. R.; Rowson, S. A.; Neigh, G. N. Measuring corticosterone concentrations over a physiological dynamic range in female rats. *Physiol. Behav.* **2018**, 194, 73-76.

Baratta, A. M.; Buck, S. A.; Buchla, A. D.; Fabian, C. B.; Chen, S.; Mong, J. A.; Pocivavsek, A. Sex Differences in Hippocampal Memory and Kynurenic Acid Formation Following Acute Sleep Deprivation in Rats. *Scientific Reports*, **2018**, 8, *1*, 6963.

Hui, J.; Zhang, J.; Pu, M.; Zhou, X.; Dong, L.; Mao, X.; Shi, G.; Zou, J.; Wu, J.; Jiang, D.; Xi, G. Modulation of GSK-3β/β-Catenin Signaling Contributes to Learning and Memory Impairment in a Rat Model of Depression. *The International Journal of Neuropsychopharmacology*. **2018**, *21, 9*, 858-870.

Jaglin, M.; Rhimi, M.; Philippe, C.; Pons, N.; Bruneau, A.; Goustard, B.; Daugé, V.; Maguin, E.; Naudon, L.; Rabot, S. Indole, a Signaling Molecule Produced by the Gut Microbiota, Negatively Impacts Emotional Behaviors in Rats. *Frontiers in Neuroscience*. **2018**, *12*, 216.

Martins, N. O.; de Brito, I. M.; Araújo, S.; Negri, G.; Carlini, E. A.; Mendes, F. R. Antioxidant, anticholinesterase and antifatigue effects of *Trichilia catigua* (catuaba). *BMC Complementary and Alternative Medicine*. **2018**, *18, 1*, 172.

Singh-Taylor, A.; Molet, J.; Jiang, S.; Korosi, A.; Bolton, J. L.; Noam, Y.; Simeone, K.; Cope, J.; Chen, Y.; Mortazavi, A.; Baram, T. Z. NRSF-dependent epigenetic mechanisms contribute to programming of stress-sensitive neurons by neonatal experience, promoting resilience. *Molecular Psychiatry*. **2017**, *23, 3*, 648-657.

Opperhuizen, A. L.; Stenvers, D. J.; Jansen, R. D.; Foppen, E.; Fliers, E.; Kalsbeek, A. Light at night acutely impairs glucose tolerance in a time-, intensity- and wavelength-dependent manner in rats. *Diabetologia*. **2017**, *60, 7*, 1333-1343.

Corticosterone – Rat - *cont.*

Varlinskaya, E. I.; Kim, E. U.; Spear, L. P. Chronic intermittent ethanol exposure during adolescence: Effects on stress-induced social alterations and social drinking in adulthood. *Brain Research*. **2016**, *1654, Pt B*, 145-156.

Gillette, R.; Miller-Crews, I.; Nilsson, E. E.; Skinner, M. K.; Gore, A. C.; Crews, D. Sexually dimorphic effects of ancestral exposure to vinclozolin on stress reactivity in rats. *Endocrinology*. **2014**, *155, 10*, 3853-66.

Lindqvist, A.; Mohapel, P.; Bouter, B.; Frielingsdorf, H.; Pizzo, D.; Brundin, P.; Erlanson-Albertsson, C. High-fat diet impairs hippocampal neurogenesis in male rats. *European Journal of Neurology*. **2006**, *13*, 1385-1388.

Corticosterone – Snake

Palacios, M. G.; Sparkman, A. M.; Bronikowski, A. M. Corticosterone and pace of life in two life-history ecotypes of the garter snake *Thamnophis elegans*. *General and Comparative Endocrinology*. **2012**, *175, 3*, 443-448.

Corticosterone – Turtle

Hunt, K. E.; Innis, C.; Merigo, C.; Burgess, E. A.; Norton, T.; Davis, D.; Kennedy, A. E.; Buck, C. L. Ameliorating transport-related stress in endangered Kemp's ridley sea turtles (*Lepidochelys kempii*) with a recovery period in saltwater pools. *Conserv Physiol.* **2019**, *7, 1*, coy065.

Corticosterone – Vole

Blondel, D. V.; Wallace, G. N.; Calderone, S.; Gorinshteyn, M.; St Mary, C. M.; Phelps, S. M. Effects of population density on corticosterone levels of prairie voles in the field. *General and Comparative Endocrinology*. **2015**, *225*, 13-22.

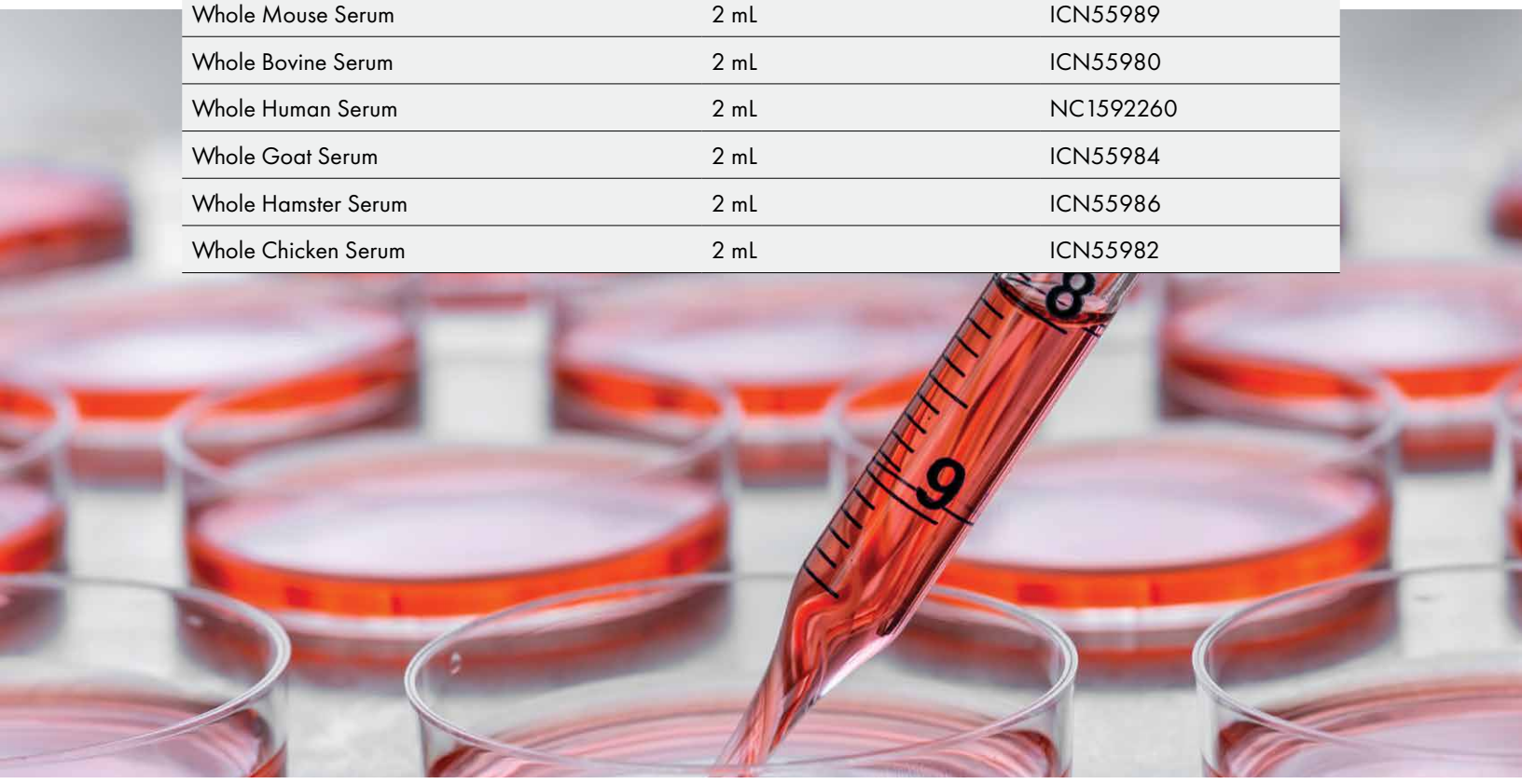
Animal Sera for Immunoassays

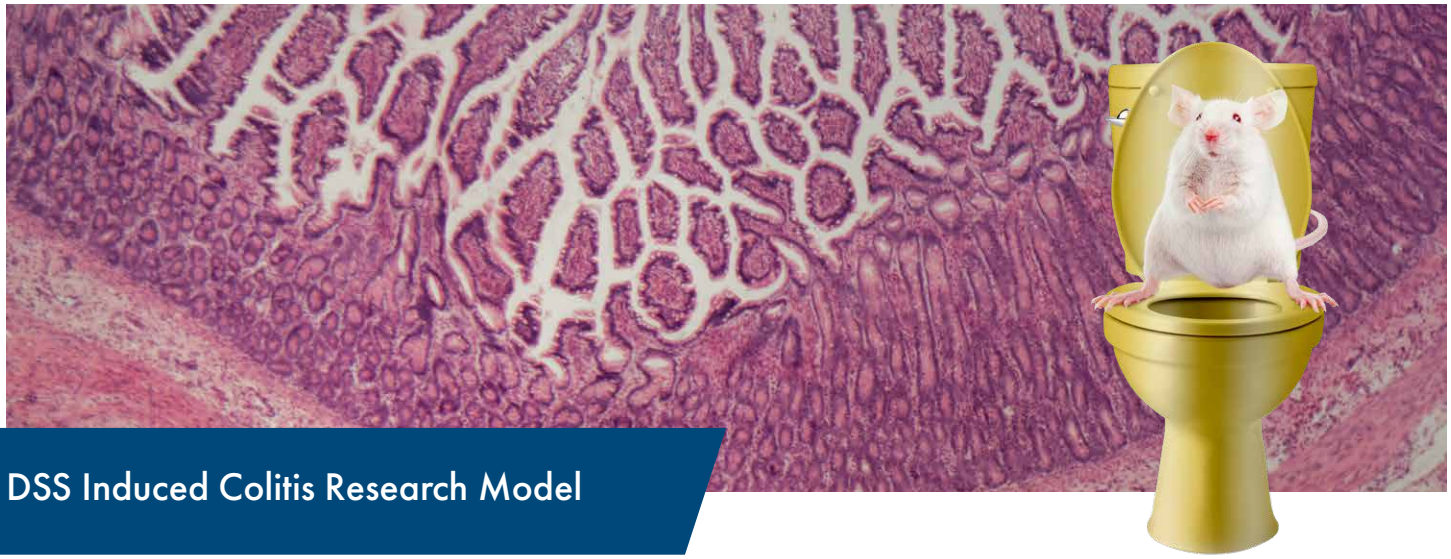
Normal and whole sera are non-immune serum samples prepared from the blood of healthy human, goat, mouse, rabbit, pig, or other species. They provide sufficient quantities of endogenous proteins to saturate and block nonspecific binding interactions for a wide range of immunological applications, including immunohistochemistry (IHC), ELISA and Western blotting. MP Bio offers a wide range of high-quality, disease-free sera from a variety of species.

Advantages and Features:

High quality from healthy animals or donors	Versatile for blocking or saturating nonspecific interactions	Comprehensive collection from various species	Constant availability

Description	Size	Cat. No.
Normal Goat Serum	50 mL	ICN642921
Normal Mouse Serum	10 mL	ICN642931
Normal Sheep Serum	50 mL, 100 mL	ICN642951
Normal Rat Serum	10 mL	ICN642941
Whole Horse Serum	2 mL	ICN55987
Whole Swine Serum	2 mL	ICN55993
Whole Mouse Serum	2 mL	ICN55989
Whole Bovine Serum	2 mL	ICN55980
Whole Human Serum	2 mL	NC1592260
Whole Goat Serum	2 mL	ICN55984
Whole Hamster Serum	2 mL	ICN55986
Whole Chicken Serum	2 mL	ICN55982





DSS Induced Colitis Research Model

Inflammatory Bowel Disease (IBD) is characterized by chronic and relapsing inflammation of the gastrointestinal tract and is associated with an increased risk of developing colitis-associated cancer. Several animal models have been used to study colitis. One such model involves the oral administration of dextran sulfate sodium salt (DSS) in the drinking water of mice, leading to chronic colitis. This DSS induced colitis model is spontaneous and used to assess the therapeutic potential of treatments for IBD.

Accelerate your IBD research with the most validated and attested Dextran Sulfate Sodium Salt.

Highest sulfur content: **19%**

Highest chirality: **+104°** of specific rotation

Lowest pH: **6.2** at 1% solution

Over **3,000** publications

Dextran Sulfate Sodium Salt (DSS) is a polyanionic derivative of Dextran. Our DSS is offered at the highest quality and purity and is the most reproducible form. This allows for its use in a variety of research applications, such as clinical, molecular biology, biomedical and even cosmetics.

Dextran Sulfate Sodium Salt has the following properties:

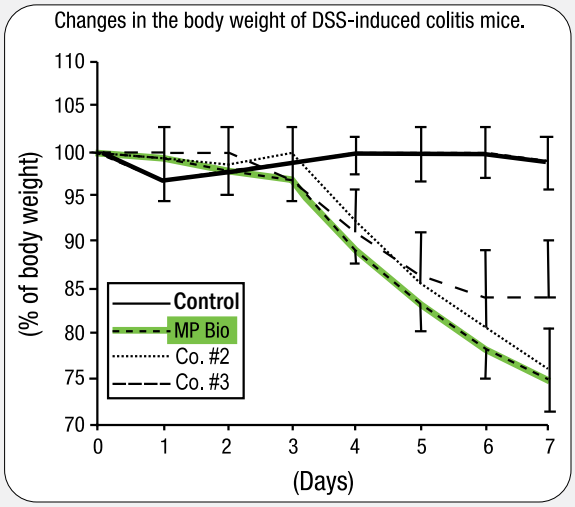
- **Water soluble polyanion**
- **Forms a clear solution and mimics natural mucopolysaccharides**
- **High purity and excellent stability**
- **Readily degradable by ecological systems**
- **Acts as a stabilizer for sensitive natural ingredients**

"In our opinion, MP Biomedical's Dextran Sulfate Sodium Salt (36,000-50,000 M.Wt.) Colitis Grade is the best product available on the market for reliably inducing colitis in mice. Using this product, we observe consistent body weight loss, disease severity and changes in colon length in various strains of mice. With MP Bio's DSS we have never experienced lot to lot variability."

–Dr. Natacha Steinckwich-Besancon, Ph.D., Invivotek LLC, a member of Genesis Biotechnology Group

The Proven Gold Standard

Bamba et al[1] performed a comparative analysis of 3 different DSS preparations to examine the chemical and cytotoxic properties as well as severity of colitis. Their study concluded that DSS from MP Bio most effectively induced colitis, as indicated by body weight transition, DAI score, colon weight/length and histological scores.



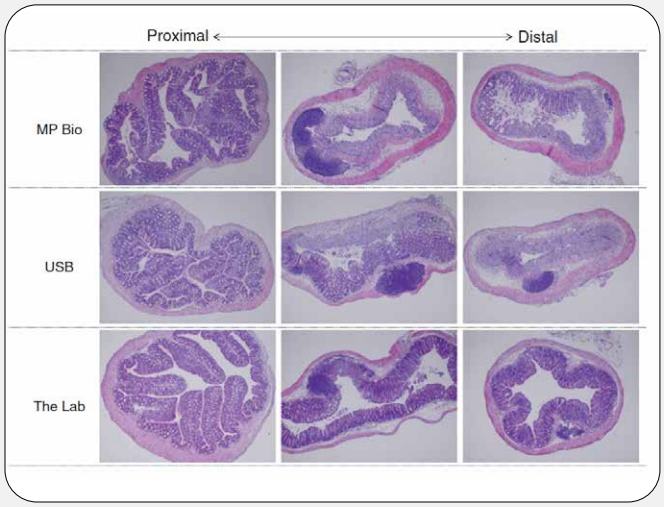


Figure 1. Changes in body weight loss as reported by Bamba et al.

Variability of protocols can lead to variability in results. We suggest following the guidelines, as reported in the literature:

Critical parameters and key factors in applications utilizing DSS for colitis research are discussed in an article in Current Protocols in Immunology[2]: *"The successful and reproducible induction of DSS-induced colitis depends on numerous key factors, including DSS source, lot #, molecular weight, concentration, duration, mouse strain, source, age, gender and body weight as well as environmental factors including the hygienic condition of the vivarium[3]. If high mortality is observed, suggesting high susceptibility to DSS, a decreased dose of DSS should be adopted. If no or weak colitis is observed, suggesting low susceptibility, an increase in DSS concentration and/or duration should be considered."*

A sharp DSS dose-response curve (for weight loss) enables sensitive screening for susceptible or resistant mutants (Figure 2). In this protocol, ENU-mutagenized C57BL/6J G3 mice are fed for several days with 1% DSS from MP Bio (w/v) in the drinking water, a dosage that is insufficient to cause weight loss in wild type C57BL/6J mice.

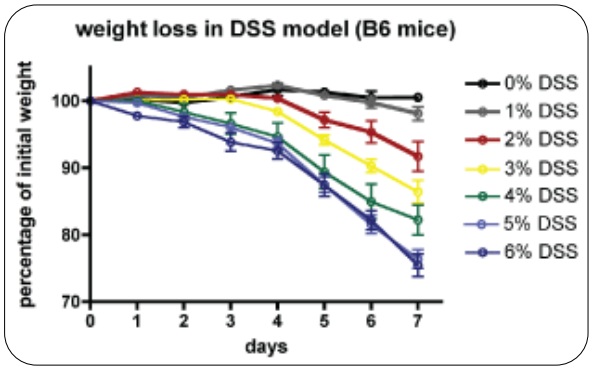


Figure 2. Relationship between the dose of DSS and weight loss. Mice were exposed to 0-6% DSS in drinking water for 7 days. Body weight, expressed as percentage of weight on the day of first exposure to DSS, is plotted against time. n=14 for each group.[4]

Improve effectiveness of DSS by combining with Azoxymethane (AOM)

Research on IBD and Crohn's disease using animal models has been conducted using various chemicals. In addition to MP Bio product 02160110 (DSS 35,000-50,000 MW), chemically induced mouse models of intestinal inflammation were reported using 2,4,6-trinitro benzene sulfonic acid (TNBS) and oxazolone.[5]

Recently, to reduce the amount of time needed to induce intestinal inflammation or colorectal cancer in animal models, combinations of chemicals have been utilized.[6] High effectiveness is shown by the azoxymethane (AOM)/DSS combination.[7-9]

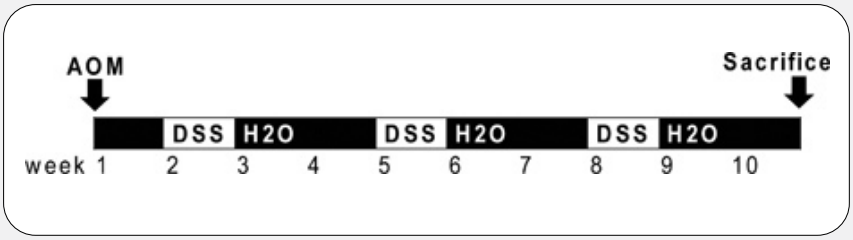


Figure 3. Schematic of AOM and DSS administration. AOM (10 mg/kg) is injected on day 0. At the beginning of the second week (day 7), 2.5% DSS solution is administered to mice in their drinking water. Seven days of DSS treatment is followed by two weeks of autoclaved water. An additional two cycles of DSS are administered prior to sacrifice.[7]

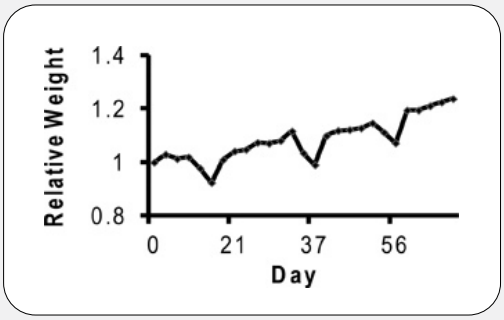


Figure 4. Mouse weight relative to baseline during AOM and DSS administration. Note that in the week following each DSS cycle, mice lose 5-10% of their body weight. Weight loss in this experiment is a surrogate marker for colitis severity.[7]

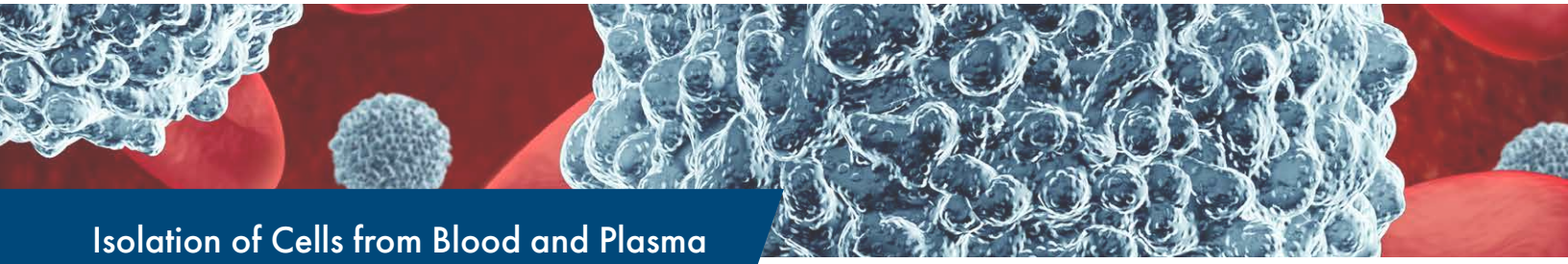
Description	Size	Cat. No.
Dextran Sulfate Sodium Salt (36,000 – 50,000 Da) The most recommended and cited DSS	1 g	MP216011001
	10 g	ICN16011010
	25 g	MP216011025
	50 g	ICN16011050
	100 g	ICN16011080
	500 g	ICN16011090

References:

[1] Bamba, S. et al. *Digestive Diseases and Sciences*. **2012**, *57 (2)*, 327-334.
[2] Chassaing, B. et al. *Curr. Protoc. Immunol.* **2014**, *104*, 15.25.1-15.25.14
[3] Nell, S. et al. *Nature reviews. Microbiology*. **2010**, *8*, 564-577.
[4] https://mutagenetix.utsouthwestern.edu/protocol/protocol_rec.cfm?pid=9
[5] Wirtz, S. et al. *Nat. Protoc.* **2007**, *2*, 541-546.
[6] De Robertis, M. et al. *J. Carcinog.* **2011**, *10*, 9.
[7] Thaker, A. et al. *J. Vis Exp.* **2012**, *67*, 4100.
[8] Parang, B. et al. *Methods Mol. Biol.* **2016**, *1422*, 297-307.
[9] Angelou, A. et al. *Anticancer Res.* **2018**, *38 (6)*, 3467-3470.

Dosage of DSS for different strains of mice:

Animal/Strain	Dose	Days	Publication
C57BL/6	2.5%	8	Jia, Q.; Ivanov, I.; Zlatev, Z.; et al. Dietary fish oil and curcumin combine to modulate colonic cytokinetics and gene expression in dextran sodium sulphate-treated mice. *Br.J.Nutr.* **2011**, *106(4)*, 519-9.
Wild-type C57BL/6J(m)	3%	6	Thiess, A.L.; Laroui, H.; Obertone, T.S.; et al. Nanoparticle-based therapeutic delivery of prohibitin to the colonic epithelial cells ameliorates acute murine colitis. *Inflamm. Bowel Dis.* **2011**, *17(5)*, 1163-76.
C57BL/6 AhR null, WT	3.5%	7	Arsenescu, R.; Arsenescu, V.; Zhong, J.; et al. Role of xenobiotic receptor in inflammatory bowel disease. *Inflamm. Bowel Dis.* **2011**, *17(5)*, 1149-2.
C57BL/6	5%	3-14	Nagalingham, N.A.; Kao, J.Y.; Young, V.B. Microbial ecology of the murine gut associated with the development of dextran sodium sulfate-induced colitis. *Inflamm, Bowel Disease.* **2011**, *7(4)*, 917-26.
C57BL/6	1.5%	7	Ramakers, J.; Verstege, M.I.; Thuijls, G.; et al. The PPARγ agonist rosiglitazone impairs colonic inflammation in mice with experimental colitis. *J.Clin.Immunol.* **2007**, *27(3)*, 275-283.
BALB/c	1%	10	Palffy, R.; Gardlik, R.; Behuliak, M.; et al. Salmonella-mediated gene therapy in experimental colitis in mice. *Ex.Biol.Med.* **2011**, *236(2)*, 177-83.
C57BL/6J	3%	5	Shiomi, Y.; Nishiumi, S.; Ooi, M.; et al. GCMS-based metabolomic study in mice with colitis induced by dextran sulfate sodium. *Inflamm. Bowel Dis.* **2011**, *17(11)*, 2261-74.
BALB/c	1-5%	10	Rochat, T.; Bermudez-Humaran, L.; Gratadoux, J-J.; et al. Anti-infammatory effects of Lactobacillus casei BL23 producing or not a manganese-dependent catalase on DSS-induced colitis in mice. *Microb. CellFact.* **2007**, *20(6)*, 22.
BALB/c; NMRI/KI	2.5-5%	n/a	Bylund-Fellenius, A-C.; Landström, E.; Axelsson, L.G.; et al. Experimental colitis induced by dextran sulphate in normal and germfree mice. *Microbial Ecology in Health and Disease.* **1994**, *7*, 207-215.
IL-5-/- and +/+	2.9%, 5%	9	Stevceva, L.; Pavli, P.; Husband, A.; et al. Eosinophilia is attenuated in experimental colitis induced in IL-5 deficient mice. *Genes Immun.* **2000**, *1(3)*, 213-8.
BALB/c; athymic nu/nu CD-1 (BR)	2.5-5%	7-35	Axelsson, L.G.; Landström, E.; Bylund-Fellenius, A.C. Experimental colitis induced by dextran sulphate sodium in mice: Beneficial effects of sulphasalazine and olsalazine. *Aliment. Pharmacol.Ther.* **1998**, *12(9)*, 925-34.
WT; CCR9(-/-); CCL25 (-/-)	2%	7	Wurbel, M.A.; McIntyre, M.G.; Dwyer, P.; et al. CCL25/CCR9 interactions regulate large intestinal inflammation in a murine model of acute colitis. *PLoS One.* **2011**, *6(1)*, e16442.
Wild-type; DPIV -/-	2%	6	Yazbeck, R.; Howard, G.S.; Butler, R.N.; et al. Biochemical and histological changes in the small intestine of mice with dextran sulfate sodium induced colitis. *J.Cell Physiol.* **2011**, *226(12)*, 319-24.
BALB/c	5%	7	Kumar, G.K.; Dhamotharan, R.; Kulkarni, N.M. Embelin ameliorates dextran sodium sulfate-induced colitis in mice. *Int. Immunopharmacol.* **2011**, E



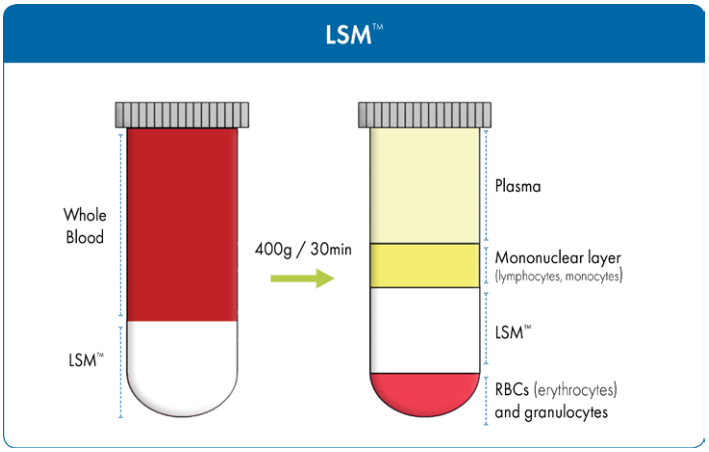
Isolation of Cells from Blood and Plasma

Blood is composed of several cell types that need to be routinely isolated, such as monocytes, lymphocytes, and polymorphonuclear leukocytes. Isolation of mononuclear and polymorphonuclear cells from blood serves as the starting point for a wide spectrum of immunology studies. One challenge for many researchers is how to specifically isolate mononuclear and polymorphonuclear cells from blood with high yield and cell viability. MP Bio offers three products for the isolation of mononuclear and polymorphonuclear cells from human peripheral blood, bone marrow, and umbilical cord blood. Lymphocyte Separation Medium (LSM™), LymphoSep™, and Mono-Poly™ Resolving Medium have been used for these applications by researchers worldwide.

Mononuclear Cell Isolation for Research Use

Lymphocyte Separation Medium (LSM™) is a legendary tool to separate lymphocytes from human peripheral blood, as well as bone marrow and umbilical cord blood. As proven by more than 2,200 scientific publications, it ensures:

- **Maximum yield of monocytes**
- **> 96% cell viability of lymphocytes**
- **Easy one-step centrifugation**
- **Low endotoxin levels**
- **Sterility**



Lymphocyte Separation for in vitro Diagnostics

LymphoSep® lymphocyte separation medium from MP Bio is based on the original Bøyum formulation with a density of 1.077 g/mL. It is validated for *in vitro* diagnostic (IVD) usage and has designation as an FDA class I exempt medical device for lymphocyte separation (21CFR864.8500). It offers similar product features to our Lymphocyte Separation Medium (LSM™), but it is specifically designed for in vitro diagnostic use.

Mononuclear and Polymorphonuclear Isolation in One Step

When it is necessary to separate both mononuclear and polymorphonuclear cells from blood, Mono-Poly™ Resolving Medium (Mono-Poly™, M-PRM) may be used. Differential migration during centrifugation allows for the resolution of both mononuclear and polymorphonuclear leukocytes into two distinct bands that are relatively free of erythrocytes. This can be performed in a one-step centrifugation process.

Description	Size	Cat. No.
LSM™ - Lymphocyte Separation Medium	5 x 100 mL	ICN50494
LymphoSep™	500 mL	ICN1692254
Mono-Poly™ Resolving Medium	100 mL	ICN1698049

Induced Immune Response in Animals

Freund's adjuvant is a solution of antigen emulsified in mineral oil and used as an immunopotentiator. MP Bio offers both Freund's Complete Adjuvant and Incomplete Adjuvant with strong and persistent immune response in animals.

Freund's Complete Adjuvant contains killed mycobacterium tuberculosis, attracting macrophages and other cells to the injection site. Therefore, it is used for the initial injections to enhance the immune response. On the contrary, Freund's Incomplete Adjuvant is commonly used for boosts with minimized side effects, as it does not contain inflammation-causing mycobacteria.

Description	Size	Cat. No.
Freund's Incomplete Adjuvant	50 mL	ICN642861
	25 mL	ICN55829
Freund's Complete Adjuvant	50 mL	ICN642851

7X™ Ready-to-use Detergent

Ideal for instrument and glassware cleaning

- Effective, water-soluble and eco-friendly cleaning solutions
- Does not etch glass or plastic labware
- Nontoxic for tissue and cell cultures
- Eliminates interfering fluorescence residues for flow cytometry
- No need for pH adjustment
- Easy and safe to use, no gloves required
- Concentrated – 1 gallon can make up to 100 gallons of cleaning solution

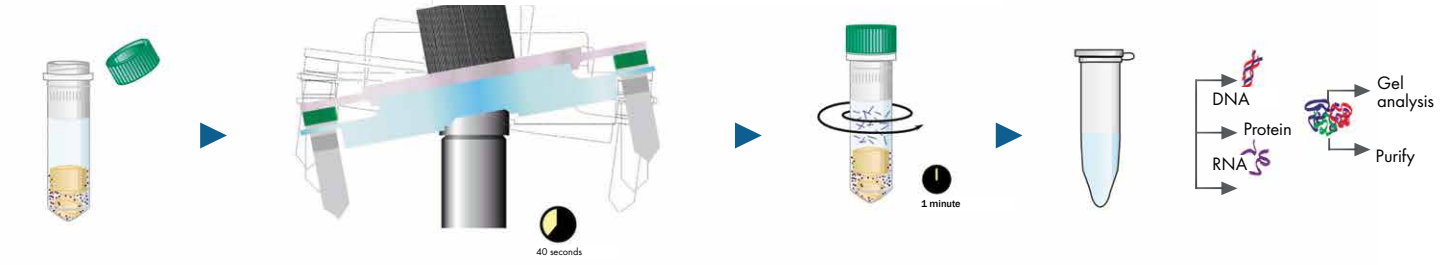
Description	Size	Cat. No.
7X Cleaning Solution	1 gal	ICN7667093
7X Cleaning Solution	4 x 1 gal	ICN7667094
7X-O-Matic Solution, Machine Wash	4 x 1 gal	ICN7667494
ES 7X Cleaning Solution, Environment-Safe	4 x 1 gal	ICN7667194
ES 7X Cleaning Solution, Environment-Safe	1 gal	ICN7667193

Trusted for over 65 years, cleanup has never been so easy!

Sample Preparation and Nucleic Acid Isolation

FastPrep® instruments, Lysing Matrix tubes and kits from MP Bio offer a complete solution for your sample preparation needs. FastPrep systems are ideally suited for animal research work, including preparing samples from cells, animal tissues, bone, insects, feces and more. Lyse, homogenize or grind any sample to extract and purify high yields of DNA, RNA and proteins in 40 seconds or less.

FastPrep Workflow



1. Prepare lysis tube
2. Process with FastPrep Instrument
3. Centrifuge to pellet debris
4. Transfer cleared lysate

FastPrep-24™ 5G Instruments and Adapters

A benchtop instrument based on bead-beating technology, the FastPrep-24 5G is a versatile sample disruption device providing the ultimate in speed and performance for the lysis of biological samples. A self-contained system, the FastPrep-24 5G eliminates the risk of cross-contamination and time-consuming cleanup associated with manual lysis methods. The instrument provides complete and quantitative lysis of difficult and routine samples and is suitable in all applications that require grinding, lysing, or homogenization.

- Consistent results
- Interchangeable adapters for flexibility in sample size and cryogenic lysis capability
- High reproducibility with precise setting of lysis time and speed
- Easy touch screen user interface
- Power to homogenize resistant samples with ease
- High Yields

FastPrep-24™ 5G

Cat. No. 11-600-5500

QuickPrep™ 3 Adapter included with instrument

FastPrep-24 Adapters are flexible, interchangeable and available for ambient or cryogenic sample types

MP Bio offers the widest selection of adapters to best meet your needs in sample grinding. Our adapters allow for sample sizes ranging from 2 to 250 mL tubes and are built for durability in ambient and cryogenic conditions.

Ambient Temperature Adapters for FastPrep-24™ 5G Instruments

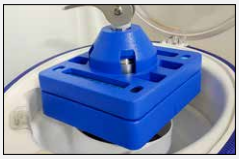
QuickPrep™ 3 Adapter
24 x 2 mL tubes
(included with FastPrep-24™ 5G instrument)
Cat. No. MP116005512

TeenPrep™ Adapter
12 x 15 mL tubes

Cat. No. ICN6002526

HiPrep™ Adapter
48 x 2 mL tubes

Cat. No. ICN6002527



BigPrep™ Adapter
2 x 50 mL tubes

Cat. No. MP116002525

TallPrep™ Adapter
24 x 4.5 mL tubes

Cat. No. MP116002540

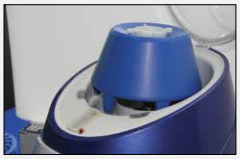
Cryogenic Temperature Adapters for FastPrep-24™ 5G Instruments

During mechanical lysis, the temperature within the tube can increase. This can cause damage to the molecules in the sample, especially proteins or RNA, which can be damaged at higher temperatures.

- **Protects thermosensitive molecules** from heat degradation due to an innovative cooling chamber design.
- **Prevents the increase of sample temperature** during the homogenization process by maintaining sample temperature at 4°C.
- **Ensures a highly effective grinding process for any sample,** even the most elastic, by making them brittle.

CoolPrep™ Adapter
24 x 2 mL tubes

Cat. No. ICN6002528



CoolTeenPrep™ Adapter
6 x 15 mL tubes

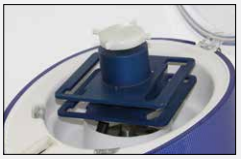
Cat. No. ICN6002530

CoolBigPrep™ Adapter
2 x 50 mL tubes

Cat. No. MP116002531

Metal Adapters for FastPrep-24™ 5G Instruments

All-Metal adapters are ideally suited for work with highly infectious, pathogenic or other biologically hazardous samples. They withstand temperatures of up to 450°C, allowing for sterilization by pyrolysis or autoclaving. Pathogens, including bacteria, viruses, fungi, parasites, viroids and prions, can be effectively eliminated. All-Metal adapters are also safe to use with most laboratory detergents and sterilization solutions, ensuring easy care and maintenance.

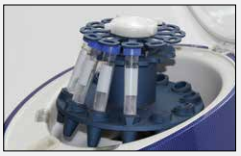


Metal BigPrep™ Adapter
2 x 50 mL tubes

Cat. No. 11-600-2547

Metal QuickPrep™ Adapter
24 x 2 mL tubes

Cat. No. MP116002545



Metal TeenPrep™ Adapter
12 x 15 mL tubes

Cat. No. 11-600-2546

FastPrep-96™ Instruments and Adapters

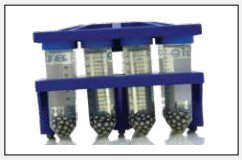
The FastPrep-96 delivers superior performance, speed and reproducibility with high-throughput capabilities – process up to 192 samples simultaneously in 2 x 96 deep well plates. MP Bio's high throughput device offers exceptional versatility with interchangeable adapters and fast processing speeds. The true linear motion of FastPrep-96 eliminates the need to re-orient plates mid-cycle.

FastPrep-96 offers a large variety of adapters (2 x 96 deep well plates, 96 x 2 mL, 48 x 4.5 mL, 20 x 15 mL, 8 x 50 mL and 2 x 250 mL) and a simple, accurate, closed loop control of lysing power and speed. All this and more makes the FastPrep-96™ the perfect solution for all of your high throughput or high volume sample grinding needs.

FastPrep-96™

Cat. No. MP116010500

2 x 96 well plate adapter included with instrument



BigFlex™ Adapter
8 x 50 mL tubes

Cat. No. MP116010550

TeenFlex™ Adapter
20 x 15 mL tubes

Cat. No. MP116010560

LargeFlex™ Adapter
2 x 250 mL bottles

Cat. No. MP116010590

Lysing Matrix Tubes

FastPrep® Lysing Matrix makes difficult-to-lyse samples easy. No matter how tough or resistant your samples, our bead beating tubes will effectively disrupt cell walls, providing the highest yields of nucleic acids and proteins in a matter of seconds. Lysing Matrix tubes from MP Bio are highly reproducible with no cross-contamination. All Lysing Matrix tubes are standard sizes and fit just about any homogenizer on the market. We offer a wide variety of lysing beads and matrices to fit all sample types and applications.

Optimal cell disruption for any sample	Size and composition optimized according to sample type	No cross contamination with closed Lysing Matrix tubes
Available in 2 mL, 4.5 mL, 15 mL, 50 mL tubes or 96 well plates	Fit any high-speed bead-beating homogenizers	Validated worldwide with 3,000+ Lysing Matrix specific publications

FastPrep® Lysing Matrix tubes range from low to high impaction, breaking down any sample type whether the cell walls are hard or soft. Sample types include, but are not limited to, human, animal, and plant tissues; microorganisms like bacteria, yeast and fungi; soil; feces; plus insects and worms.

Impact-resistant Lysing Matrix tubes with beads are available in 2 mL, 4.5 mL, 15 mL, 50 mL and 96-well format sizes and contain a wide variety of materials to meet your lysing, grinding, and homogenization needs. All matrix particles are produced to the highest quality standards to ensure optimum performance. The lysing matrix particles are then dispensed into the Lysing Matrix tubes under a rigorous set of proprietary conditions, allowing complete confidence for immediate use.

For optimal performance and results, we recommend using the Lysing Matrix tubes in conjunction with our FastPrep instruments to ensure easy grinding, lysing, and homogenization of any sample type in seconds.

Lysing Matrix	Matrix Composition	Lysing Matrix	Matrix Composition
A	Garnet matrix and 1/4 inch ceramic spheres	I	2 mm yellow zirconium oxide beads and 4 mm black ceramic spheres
B	0.1 mm silica spheres	J	2 mm yellow zirconium oxide beads and 1.6 mm aluminum oxide particles
C	1 mm silica spheres	K	0.8 mm zirconium silicate beads
D	1.4 mm ceramic spheres	M	1/4 inch ceramic beads
E	1.4 mm ceramic spheres, 0.1 mm silica spheres, and 4 mm glass beads	S	1/8 inch stainless steel beads
F	1.6 mm aluminum oxide particles and 1.6 mm silicon carbide particles	SS	6.35 mm stainless steel grinding balls
G	1.6 mm silicon carbide particles and 2 mm glass beads	Y	0.5 mm diameter Yttria-stabilized zirconium oxide beads
H	2 mm glass beads and 2 mm yellow zirconium oxide beads	Z	2 mm diameter Yttria-stabilized zirconium oxide beads

	Sample Type	Lysing Matrix						
	Animal & Human Tissues	A	D	K	M	S	SS	Z
Soft Tissues	Lung, Breast, Kidney, Heart, Intestine, Muscle, Spleen, Liver, Brain	•	•			•	•	•
Unique Samples	Skin	•	•					
	Nail					•		
	Tail, Ear	•				•		
	Vascular tissue	•	•					•
	Hair					•		
	Bone	•		•	•	•	•	
	Tumor	•				•		
	Mammalian cell	•	•					•
	Infected tissue (isolation of viruses or bacteria)				•			

Description	Pack Size	Cat. No.
Lysing Matrix A	50 x 2 mL	MP116910050
	100 x 2 mL	MP116910100
	500 x 2 mL	MP116910500
Lysing Matrix A	25 x 4.5 mL	MP116970025
	50 x 4.5 mL	MP116970050
	100 x 4.5 mL	MP116970100
Lysing Matrix A	5 x 15 mL	MP116930005
	25 x 15 mL	MP116930025
	50 x 15 mL	MP116930050
Lysing Matrix A	10 x 50 mL	MP116950010
	50 x 50 mL	MP116950050
Lysing Matrix A	96-well rack	MP116980001
	10 x 96-well rack	MP116980010
Lysing Matrix D	50 x 2 mL	MP116913050
	100 x 2 mL	MP116913100
	500 x 2 mL	MP116913500
Lysing Matrix D	25 x 4.5 mL	MP116973025
	50 x 4.5 mL	MP116973050
	100 x 4.5 mL	MP116973100
Lysing Matrix D	5 x 15 mL	MP116933005
	25 x 15 mL	MP116933025
	50 x 15 mL	MP116933050
Lysing Matrix D	10 x 50 mL	MP116953010
	50 x 50 mL	MP116953050
	100 x 50 mL	MP116953100
	500 x 50 mL	MP116953500
Lysing Matrix D	96-well rack	MP116983001
	10 x 96-well rack	MP116983010
Lysing Matrix K	50 x 2 mL	MP116920050
	100 x 2 mL	MP116920100

Description	Pack Size	Cat. No.
Lysing Matrix M	50 x 2 mL	MP116923050
	100 x 2 mL	MP116923100
	500 x 2 mL	MP116923500
Lysing Matrix M	25 x 15 mL	MP116939025
	50 x 15 mL	MP116939050
Lysing Matrix M	10 x 50 mL	MP116959010
	50 x 50 mL	MP116959050
Lysing Matrix S	50 x 2 mL	MP116925050
	100 x 2 mL	MP116925100
	500 x 2 mL	MP116925500
Lysing Matrix S	5 x 15 mL	MP116938005
	25 x 15 mL	MP116938025
	50 x 15 mL	MP116938050
Lysing Matrix SS	10 x 50 mL	116941010
	50 x 50 mL	MP116941050
	100 x 50 mL	MP116941100
Lysing Matrix Z	50 x 2 mL	MP116961050
	100 x 2 mL	MP116961100
	500 x 2 mL	MP116961500
Lysing Matrix Z	25 x 4.5 mL	MP116985025
	50 x 4.5 mL	MP116985050
	100 x 4.5 mL	MP116985100
Lysing Matrix Z	5 x 15 mL	MP116978005
	25 x 15 mL	MP116978025
	50 x 15 mL	MP116978050
Lysing Matrix Z	10 x 50 mL	MP116979010
	50 x 50 mL	MP116979050
Lysing Matrix Z	96-well rack	MP116961001
	10 x 96-well rack	MP116961010

DNA Isolation from Animal Tissues and Cells

High performance FastDNA purification kits provide ready-to-use methods for the isolation and subsequent purification of intact DNA from any source. Eluted DNA is ready for digestion, electrophoresis, PCR, and other desired applications.

Universal FastDNA™ Kit – 11-654-0400 and FastDNA™ SPIN Kit – MP116540600

Isolate genomic DNA from plant, animal, bacteria, yeast, algae, and fungi cells	Process up to 200 mg of tissue or cells with the FastPrep instrument	Lysing Matrix A tubes, all necessary buffers and silica-based spin filters are included in the FastDNA SPIN Kit.

The FastDNA SPIN Kit quickly and efficiently isolates genomic DNA from almost any sample (plant and animal tissues, cultured cells, bacteria, yeast, fungi, insects, etc). Up to 200 mg of tissue or cells are processed with a FastPrep instrument and Lysing Matrix A tubes. The kit includes 3 different lysis buffers for the homogenization of a wide variety of sample types, and the released DNA is purified by a silica-based spin filter method. Purified DNA is ready for enzyme digestion, electrophoresis, PCR and any other desired application.

References

- Haudenshield, J. S.; Song, J. Y.; Hartman, G. L. *PLOS ONE*. **2017**, *12*, e0176567.
- Wrightson, J. M.; Wray, J. A.; Street, T. L.; Chapman, S. J.; Gleeson, F. V.; Maskell, N. A.; Peto, T. E. A.; Rahman, N. M.; Crook, D. W. M. *Chest*. **2015**, *148*, e102–e103.
- Chalermwatanachai, T.; Vilchez-Vargas, R.; Holtappels, G.; Lacoere, T.; Jáuregui, R.; Kerckhof, F.-M.; Pieper, D. H.; de Wiele, T. V.; Vaneechoutte, M.; Zele, T. V.; et al. *Scientific Reports*. **2018**, *8*, 7926.
- Tangedal, S.; Aanerud, M.; Grønseth, R.; Drengenes, C.; Wiker, H. G.; Bakke, P. S.; Eagan, T. M. *Respiratory Research*. **2017**, *18*, 164.
- Ziganshina, E. E.; Mohammed, W. S.; Shagimardanova, E. I.; Shigapova, L. H.; Ziganshin, A. M. *BMC Research Notes*. **2018**, *11*, 606.

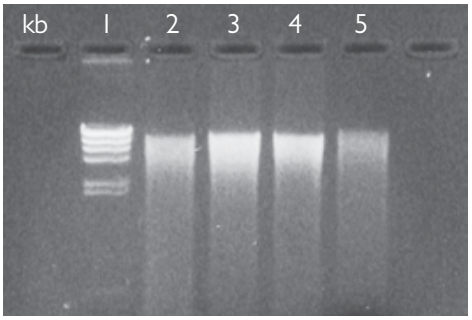
FastDNA™ SPIN Kit for Feces – MP116570200

Isolate genomic DNA from fecal samples	Process up to 500 mg of feces with FastPrep instrument	Lysing Matrix E tubes, buffers and silica-based spin filters included

The FastDNA SPIN Kit for Feces is the newest addition to the evolving FastDNA™ kit family. Prompted by you, our customer, MP Bio has developed a FastDNA SPIN Kit designed exclusively for the isolation of genomic DNA from fecal material. The FastDNA SPIN Kit for Feces includes everything you need to quickly and efficiently lyse any fecal sample, isolating high quality DNA for immediate use in downstream applications. Used in conjunction with our FastPrep-24 homogenization system, you will be able to completely lyse fecal samples in seconds with no pre-grinding or preparation.

References

- Strati, F.; Di Paola, M.; Stefanini, I.; Albanese, D.; Rizzetto, L.; Lionetti, P.; Calabrò, A.; Jousson, O.; Donati, C.; Cavalieri, D.; et al. *Front. Microbiol*. **2016**, *7*, DOI 10.3389/fmicb.2016.01227.
- Qiu, X.; Zhang, F.; Yang, X.; Wu, N.; Jiang, W.; Li, X.; Li, X.; Liu, Y. *Scientific Reports*. **2015**, *5*, 10416.
- Watanabe, K.; Igarashi, M.; Li, X.; Nakatani, A.; Miyamoto, J.; Inaba, Y.; Sutou, A.; Saito, T.; Sato, T.; Tachibana, N.; et al. *PLOS ONE*. **2018**, *13*, e0202083.
- Nale, J.; Redgwell, T.; Millard, A.; Clokie, M.; Nale, J. Y.; Redgwell, T. A.; Millard, A.; Clokie, M. R. J. *Antibiotics*. **2018**, *7*, 13.
- Nicolucci, A. C.; Hume, M. P.; Martínez, I.; Mayengbam, S.; Walter, J.; Reimer, R. A. *Gastroenterology*. **2017**, *153*, 711–722.



DNA from fecal samples with the FastDNA™ SPIN Kit for Feces. DNA was loaded on a 1.2% agarose gel (0.5X TAE).
Lane 1: Lamda HindIII Marker
Lane 2: Bovine stool 200 ng DNA
Lane 3: Equine stool 200 ng DNA
Lane 4: Feline stool 200 ng DNA
Lane 5: Avian stool 200 ng DNA

FastDNA™ SPIN Kit for Plant and Animal Tissue – MP116540800

The FastDNA SPIN Kit for Plant and Animal Tissues quickly and efficiently isolates high quality genomic DNA from plant and animal tissues using Lysing Matrix D (1.4 mm ceramic beads) for cell lysis and a silica-based spin filter method for the purification process.

Isolate genomic DNA from plant and animal tissues

Lysing Matrix D, buffers and silica-based spin filters included

References

- Holdhoff, M.; Schmidt, K.; Diehl, F.; Aggrawal, N.; Angenendt, P.; Romans, K.; Edelstein, D. L.; Torbenson, M.; Kinzler, K.W.; Vogelstein, B.; Choti, M. A.; L. A. Diaz, Jr., L. A. *Clinical. Cancer Research.* **2011**, *17*, 3551.
- Fleischhacker, M.; Schulz, S.; Johrens, K.; von Lilienfeld-Toal, M.; Held, T.; Fietze, E.; Schewe, C.; Petersen, I.; Ruhnke, M. *Clinical Microbiology and Infection.* **2012**, *18*, 1010.

FastDNA™-96 Kits

High-throughput FastDNA-96 purification kits provide ready-to-use methods for the isolation and subsequent purification of intact genomic DNA from virtually any source. Samples can be lysed in approximately 60 seconds using the FastPrep-96 instrument. Eluted DNA is ready for digestion, electrophoresis, PCR, and any other desired application.

FastDNA™-96 Tissue and Insect DNA Kit – MP119696500

Isolate genomic, viral, and mitochondrial DNA from animal tissues, cultured mammalian cells, whole blood, insects, and arthropods in approximately 40 minutes

FastDNA™-96 Fecal DNA Kit – MP119696400

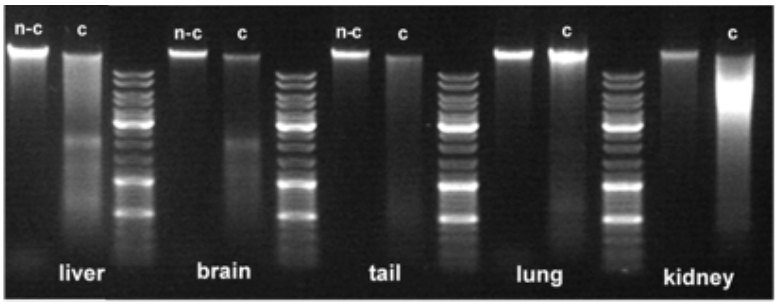
Isolate genomic DNA from microbes, fungi, parasites and other fecal organisms in approximately 50 minutes

RapidPure DNA Tissue Kit - MP112711050

Superior non-chaotropic chemistry

Time savings through faster protocols. Up to 50 µg DNA in just 15 minutes after lysis step	Higher DNA yields from precious samples	More intact DNA

The RapidPure DNA Tissue Kit is an ideal tool for purification of DNA from various human and animal tissues. It provides reproducible yields of highly purified genomic DNA using a unique and innovative non-chaotropic technology. Using non-chaotropic binding conditions offers strong key advantages for nucleic acid preparation, including time savings through fast protocols, higher DNA yields from precious samples and more intact DNA.



Equal amounts of rat tissues were used to isolate DNA using the RapidPure DNA Tissue Kit (n-c, non chaotropic buffers). For comparison with chaotropic chemistry, an equivalent kit from a major supplier was evaluated (c, chaotropic buffers).

RNA Isolation from Animal Tissues and Cells

FastRNA™ Pro Green Kit – MP116045050

- **Rapid and reproducible sample lysis in under 40 seconds with the FastPrep Instrument**
- **Safe and consistent RNA isolation with the single-reagent RNAPro solution**

The FastRNA Pro Green Kit is designed to isolate total RNA from any type of plant and animal tissue or cultured cells. Using FastPrep instruments, between 50-500 mg of tissue can be homogenized by Lysing Matrix D in impact-resistant 2 mL tubes. Total RNA is released into the proprietary, protective RNApro™ Solution, followed by extraction with chloroform and precipitation. High quality RNA is ready for all downstream applications including RT-PCR, gene expression, and microarray analysis.

References

- Dvorakova, M. C.; Mistrova, E.; Paddenberg, R.; Kummer, W.; Slavikova, J. *Frontiers in Physiology*. **2018**, *9*, 918.
- Ji, X.; Zhang, Q.; Zheng, W.; Yao, W. *Journal of Animal Science and Biotechnology*. **2019**, *10*, 9.
- Sharma, B.; Chaube, U.; Patel, B. M. *Cardiovascular Toxicology*. **2019**, *19*, 23.

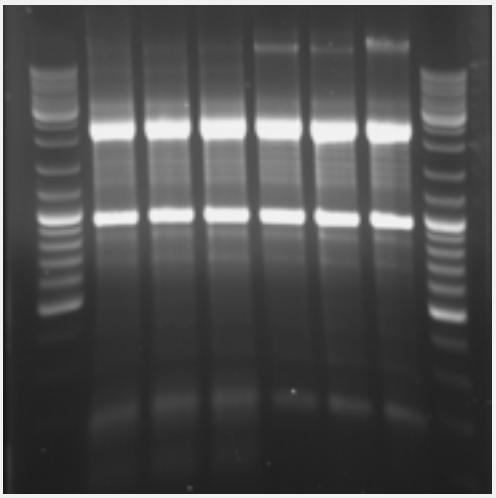
RapidPure RNA Tissue Kit – MP112721050

Pure RNA without DNase digestion

Highly purified RNA for better RT-PCR results – up to 150 µg RNA in less than 20 minutes	Selective DNA removal during lysis	No DNase digestion required

The RapidPURE RNA Tissue Kit is designed to isolate and purify high quality total RNA from small amounts of various human and animal tissues (e.g. muscle, liver, heart, and brain), tissue sections from lung, spleen, or kidney and paraffin embedded tissue samples. The kit can also be used for simultaneous isolation of total RNA and proteins.

Special buffer conditions guarantee an efficient lysis of the starting material and a simultaneous inactivation of endogenous RNases. Genomic DNA is separated from the total RNA by binding to specially optimized mineral carrier particles included in the Lysis Buffer. A specialized buffering system allows RNA species of sizes down to 200 base to bind to the Spin Filter membrane.



Total RNA was isolated from 3T3 cells using the RapidPure RNA Tissue kit. 10 µL of the RNA eluate was used for the analysis using denaturating gel electrophoresis.

Extraction Kits for Automated Nucleic Acid Purification

Automated Nucleic Acid Purification Platform

MPure-12™ is an automated benchtop system for rapid purification of nucleic acids from a wide variety of animal tissues and cells using magnetic bead separation technology. Combined with a uniquely designed magnetic bead processing chamber, the fully integrated and easy to use pre-packaged reagent kits deliver superior yields of nucleic acids and high quality results at an affordable price.

Step away from the norm and experience the difference in nucleic acid purification.

- Fully automated and integrated platform that offers cost and time savings
- Reproducibility, lot-to-lot consistency, scalability, ease-of-use and convenience
- Highest quality and yield of DNA and RNA for downstream applications
- Flexibility and simplicity: 1-12 samples from a wide range of biospecimens processed in a single cycle
- No cross-contamination of samples due to the unique platform design
- Minimized nucleic acid loss and degradation

The MPure-12 system employs an advanced magnetic bead separation technology that enables rapid and efficient purification of nucleic acids. This process includes four main steps: lysis, binding, washing and elution. Purifying nucleic acids with the MPure-12 system takes only 35 to 70 minutes depending on the selected protocol and kit.

High Quality, Reliable, Consistent Results.
Explore New Possibilities in Nucleic Acid Purification

Description	Size	Cat. No.
MPure Blood DNA Extraction Kit Purification of genomic DNA from mammalian whole blood, peripheral blood mononuclear cells, buffy coat	48 preps	MP117022100/ 11-702-2200
MPure Tissue DNA Extraction Kit Purification of genomic DNA from a variety of animal tissues, swabs and blood stains	48 preps	11-702-2400
MPure Cultured Cell DNA Extraction Kit Purification of genomic DNA from cultured cells	48 preps	11-702-2500

Wildlife Monitoring

Studying and understanding animals in the wild can provide impactful insight into the world around us and how certain circumstances can positively or negatively affect a species. However, there are many challenges related to collecting information on wild animals, especially when trying to understand the effect of stressors, both natural and man-made. Some methods of data collection can be considered invasive (blood collection), which can lead to unnatural stress levels that can potentially impact a research study. Non-invasive methods have become increasingly important and allow researchers to collect samples in a way that minimizes added stress. Such non-invasive samples include fecal matter and feathers. There are advantages associated with each type of sample, and our Corticosterone Radioimmunoassay test provides a means for obtaining the most accurate measurements of glucocorticoids from practically any sample.

"Cortisol metabolites were measured in faeces using a commercially available double antibody 125I Corticosterone RIA Kit (MP Biomedicals LLC, Thermo Fisher Scientific), that has been validated for several species (Chinnadurai et al. 2009, Millspaugh & Washburn 2004, Wasser et al. 2000) including South African herbivores (Franceschini et al. 2008). Although validation and antibody specificity was not determined in this experiment, several studies have concluded that the double-antibody RIA for corticosterone shows a better performance in the detection of FGMs in different non-domestic species because of its high cross-reactivity with different metabolites (Graham & Brown 1996, Möstl & Palme 2002, Terio et al. 1999, Wasser et al. 2000, Wielebnowski et al. 2002)."

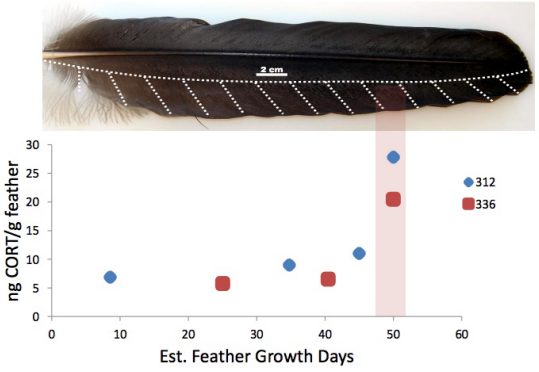
Brown, K.L. The effect of capture, confinement and immobilization on acute phase proteins, and immune and haemostatic responses in the impala (*Aepyceros melampus*). *Dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand*. 2017.

Measuring Handling Stress at Multiple Time Scales in the Chronically Lead-exposed California Condor

Conclusions

- RIA better suited for measurement and comparison of corticosterone and corticosterone metabolites across all sample types in study: plasma, urates and feathers
- Both RIA and ELISA return accurate and precise corticosterone measurements for condor plasma
- Results highlight the need to validate immunoassays for novel sample types
- Capture and handling elicits an increase in corticosterone release, measureable in urates and feathers
- Corticosterone responses to capture and handling stressor varies widely among individual condors (2-11 fold over baseline)

6. Feather grown during capture and handling stressor has higher corticosterone concentration than feather grown before stressor



Feathers from condors 312 and 336. Red arrows indicate size and location of sections on primary feather. Red shading indicates estimated time of handling event. Each section represents 4-5 days of feather growth.

Kuspa, Z.; Tubbs, C.; Smith, D.R.; et al. Measuring Handling Stress at Multiple Time Scales in the Chronically Lead-exposed California Condor. *UC Santa Cruz Graduate Research Symposium*. 2016.

Wildlife Stress Research

Validation of Fecal Glucocorticoid Metabolite Assays for South African Herbivores

"Fecal glucocorticoid metabolite (FGM) assays are a popular means of monitoring adrenocortical activity (i.e., physiological stress response) in wildlife. Species-specific differences in glucocorticoid metabolism and excretion require assay validation, including both laboratory and biological components, before assay use in new species. We validated a commercially available radioimmunoassay (MP 125I corticosterone RIA kit [MP Biomedicals, Solon, OH]) for measuring FGMs of several South African herbivores, including giraffe (Giraffa camelopardalis), impala (Aepyceros melampus), nyala (Tragelaphus buxtoni), kudu (Tragelaphus strepsiceros), wildebeest (Connochaetes taurinus), and zebra (Equus burchelli).

We validated an RIA that is capable of accurate and reliable quantification of FGM levels in 6 South African herbivores. Combined with other validation studies, our research demonstrates the utility of this RIA for FGM quantification in a diversity of wildlife species...For South African wildlife managers, this validation represented the first necessary step to successfully monitor the physiological stress response of several important wildlife species."

Chinnadurai, S. K.; Millspaugh, J. J.; Matthews, W. S.; Canter, K.; Slotow, R.; Washburn, B. E.; Woods, R. J. *The Journal of Wildlife Management.* **2009**, *73*, 1014-1020.

Ameliorating transport-related stress in endangered Kemp's ridley sea turtles (*Lepidochelys kempii*) with a recovery period in saltwater pools

"Sea turtle rehabilitation clinics and aquaria frequently transport stranded sea turtles long distances out of water, e.g. for release at sites with appropriate water temperatures. Endangered Kemp's ridley turtles (Lepidochelys kempii) are known to exhibit an adrenal stress response during such transports...Six hours in a saltwater pool appears to facilitate the recovery of Kemp's ridley sea turtles from transport-related stress and may therefore improve their readiness for release.

Unextracted plasma samples were assayed for corticosterone using a double-antibody 125I radioimmunoassay previously validated for Kemp's ridley turtle plasma (Hunt et al., 2012; catalog #07-120103, MP Biomedicals, Solon, OH, USA)."

Hunt, K.E.; Innis C.; Merigo, C.; Burgess, E.A.; Norton, T.; Davis, D.; Kennedy, A.E.; Buck, C.L. *Conserv Physiol.* **2019**, *7(1)*.

Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-tailed Deer

"Over the past decade, abnormalities have been documented in white-tailed deer (Odocoileus virginianus) in west-central Montana. Hypotheses proposed to explain these anomalies included contact with endocrine disrupting pesticides, such as imidacloprid. We evaluated the effects of imidacloprid experimentally at the South Dakota State University Wildlife and Fisheries Captive Facility where adult white-tailed deer females and their fawns were administered aqueous imidacloprid (an untreated control, 1,500 ng/L, 3,000 ng/L, and 15,000 ng/L).

FT3 and FT4 thyroid hormones reflect the ability of the deer to utilize body fat reserves, regulate basal metabolic rate, and control thermal regulation...These assays were performed with commercially available solid-phase radioimmunoassay kits (FREE T3 Solid Phase Component System and Free T4 Solid Phase Component System, MP Biomedicals Diagnostics Division Orangeburg NY 10962). The volumes of sample, assay standards, and radioligand were used according to the manufacturer's protocol. Incubation times for free T3 and free T4 assays were 2.5 h and 1.5 h, respectively, at 37 °C."

Berheim, E. H.; Jenks, J. A.; Lundgren, J. G.; Michel, E. S.; Grove, D.; Jensen, W. F. *Scientific reports.* **2019**, *9(1)*, 4534.

All animals deserve to be treated with respect...even this guy!

Countless scientific discoveries have been made possible using animal models in preclinical research, which has led to breakthroughs in vaccine development, disease treatment and improved surgical techniques. Through many advances in technology and practical applications, animal testing has become more efficient and more humane, with the overall intent to cause less harm to animals while preserving the quality of research. Afterall, nearly every medical discovery involves animal testing and research. It is our ethical responsibility to properly care for our animal subjects and ensure the least amount of distress and discomfort possible during these critical research studies. Our immunoassays provide detailed information and insight on stress hormone levels for making decisions to help improve the welfare of laboratory animals and prevent avoidable discomfort.

Species Reference Table for MP Bio Immunoassays

		Mammal																				
		Rodent										Bovidae						Canine				
Kits	Assay	Guinea Pig	Hamster	Hedgehog	Marmot	Mouse	Porcupine	Rabbit, Hare	Rat	Squirrel	Vole	Antelope	Bovine	Goat	Impala	Sheep	Wildebeest	Coyote	Dog	Dog, African Wild	Fox	Wolf
RIA Kits	2-CAT							✓								✓						
RIA Kits	ACTH					✓			✓		✓					✓			✓			
RIA Kits	Androstenedione																		✓			
RIA Kits	Corticosterone		✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
RIA Kits	Corti-cote Cortisol								✓	✓			✓	✓	✓							
RIA Kits	Cortisol							✓	✓				✓	✓	✓							
RIA Kits	Estradiol					✓			✓				✓	✓	✓	✓			✓			
RIA Kits	T3 (free)					✓													✓			✓
RIA Kits	T4 (free)								✓													
RIA Kits	Gastrin								✓										✓			
RIA Kits	Glucagon					✓			✓										✓			
RIA Kits	Growth Hormone																					
RIA Kits	Progesterone	✓				✓			✓				✓	✓	✓							
RIA Kits	Serotonin RIA					✓																
RIA Kits	T3 (total)					✓			✓				✓	✓	✓				✓			✓
RIA Kits	T3 (uptake)					✓			✓													
RIA Kits	T4 (monoclonal)					✓			✓				✓	✓	✓	✓			✓			
RIA Kits	Testosterone					✓			✓										✓			
RIA Kits	Total Estrogen					✓	✓		✓			✓	✓	✓	✓					✓		
EIA Kits	Cortisol																					
EIA Kits	Estradiol	✓																				
EIA Kits	T4 (free)								✓													
EIA Kits	HGH					✓			✓													
EIA Kits	Insulin	✓																				
EIA Kits	Noradrenaline					✓																
EIA Kits	Progesterone					✓			✓													
EIA Kits	Corticosterone				✓				✓													
EIA Kits	Serotonin																					
EIA Kits	T3 (total)		✓			✓			✓													
EIA Kits	T4 (total)					✓			✓													
EIA Kits	Testosterone					✓			✓													

		Mammal																				
		Cervidae		Feline					Mustelid		Primate							Other				
Kits	Assay	Deer, White Tail	Moose	Cat	Cheetah	Hyena	Jaguar	Leopard, Snow	Ferret	Sea Otter	Ape	Baboon	Bonobo	Gorilla	Marmoset	Monkey	Other Primates	Armadillo	Bat	Camelid	Elephant	Equine, Zebra
RIA Kits	2-CAT																					
RIA Kits	ACTH																					✓
RIA Kits	Androstenedione			✓					✓						✓							
RIA Kits	Corticosterone	✓			✓	✓	✓	✓				✓	✓			✓	✓	✓			✓	
RIA Kits	Corti-cote Cortisol													✓		✓					✓	
RIA Kits	Cortisol										✓					✓			✓			✓
RIA Kits	Estradiol			✓								✓				✓	✓					
RIA Kits	T3 (free)																					
RIA Kits	T4 (free)																					
RIA Kits	Gastrin			✓												✓						✓
RIA Kits	Glucagon																					
RIA Kits	Growth Hormone											✓				✓						
RIA Kits	Progesterone											✓				✓	✓			✓	✓	✓
RIA Kits	Serotonin RIA																					
RIA Kits	T3 (total)											✓										
RIA Kits	T3 (uptake)																					
RIA Kits	T4 (monoclonal)											✓										
RIA Kits	Testosterone					✓										✓						
RIA Kits	Total Estrogen									✓		✓				✓					✓	✓
EIA Kits	Cortisol																					
EIA Kits	Estradiol		✓																			
EIA Kits	T4 (free)																					
EIA Kits	HGH																					
EIA Kits	Insulin																					
EIA Kits	Noradrenaline																					
EIA Kits	Progesterone																					
EIA Kits	Corticosterone																					
EIA Kits	Serotonin																					
EIA Kits	T3 (total)																					
EIA Kits	T4 (total)																					
EIA Kits	Testosterone															✓						

Mammal								Avian																				Fish										Reptile				Amphib-ian				
Other																																													
Giraffe	Kangaroo	Panda	Pig	Rhino	Seal	Whale	Avian	Budgerigar	Canary	Chicken	Condor	Conure	Crane	Duck	Finch	Kestrel	Kingbird	Owl	Parrot	Perch	Quail	Seagull	Sparrow	Starling	Fish	Goldfish	Salmon	Shark	Shiner	Stickleback	Tilapia	Toadfish	Trout	Alligator	Lizard, Fence	Snake	Turtle	Frog	Salamander	Tadpole		
																																								2-CAT	RIA Kits
✓			✓																					✓							✓	✓								ACTH	
			✓																																					Androstenedione	
	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓	✓					✓			✓											✓		✓	✓	✓			Corticosterone	
																																								Corti-cote Cortisol	
✓			✓		✓															✓					✓	✓	✓				✓	✓	✓								Cortisol	
			✓											✓	✓						✓												✓				✓				Estradiol	
																									✓				✓				✓								T3 (free)	
																									✓				✓				✓								T4 (free)	
																																								Gastrin	
																																								Glucagon	
																																								Growth Hormone	
✓			✓																																					Progesterone	
																																								Serotonin RIA	
						✓																			✓			✓														T3 (total)	
																																									T3 (uptake)	
																									✓			✓					✓				✓				T4 (monoclonal)	
								✓		✓	✓	✓					✓						✓	✓	✓												✓	✓			Testosterone	
✓		✓				✓												✓																							Total Estrogen	
																		✓																							Cortisol	EIA Kits
																																									Estradiol	
																																								T4 (free)	
																																								HGH	
																																								Insulin	
			✓																																					Noradrenaline	
																																								Progesterone	
																																								Corticosterone	
								✓			✓	✓																													Serotonin	
								✓								✓													✓					✓			✓		✓		T3 (total)	
		✓						✓								✓									✓	✓			✓					✓			✓		✓		T4 (total)	
																✓																		✓							Testosterone	

One Call. One Source. A World of Animal Research Products.

- Apoptosis
- Cell Biology
- Culture Growth Media
- FastPrep® Sample Prep
- Immunology
- Molecular Biology
- Adsorbents
- Biochemicals
- Fine Chemicals
- Labware
- Dosimetry
- Research Diets
- SafTest™ Food Quality
- Diagnostics
- Drugs of Abuse
- Infectious Disease
- EIA/RIA

Contact us today:

In the United States
Order online: fishersci.com
Fax an order: 1-800-926-1166
Call customer service: 1-800-766-7000

In Canada
Order online: fishersci.ca
Fax an order: 1-800-463-2996
Call customer service: 1-800-234-7437

fisher scientific
part of Thermo Fisher Scientific

BN20203821